September 2020
Volume I

FOXTALE

The Annual Newsletter of
Indian Statistical Institute, North-East Centre, Tezpur

Cover picture by Harsha J. Das
Dudhnoi, Goalpara, Assam, May 14, 2020

Editorial

The name 'Foxtale' is inspired by the foxtail orchid, a pinkish-white flower that blooms during the spring season. The long inflorescence resembles a fluffy, tapering tail of a fox. Assam's state flower - Foxtail, commonly called Kopou Phool is strikingly delightful and an integral part of the Assamese culture. 'Tale' in lieu of 'Tail' indicates narrative, story, report, etc. Apart from the beautiful bloom, the fragrance during the warmer spring evening is also distinct. The orchid has cultural, horticultural, aesthetic, and medicinal values. It is an integral part of the Bohag Bihu celebration during April in the state of Assam. Unique, pretty remarkable, and fairly common at our location, we feel 'Foxtale' is an appropriate name for our newsletter. Among the other suggestions for a name, 'Foxtale' was the most voted one by students, staff and, the faculty.

This is the first volume of the North-East Centre's newsletter, coinciding with the first batch of students and workers moving to the independent ISI-NE campus at Tezpur. The North-East Centre of ISI at Tezpur was established in 2011, initially offering a one-year post graduate diploma course open only for the NE domiciled students. However, from 2018 onwards the course is open for candidates all over India. Although small in number, our alumni have gone on to work for reputed MNCs and startups across India and with each passing year our network becomes stronger. Apart from offering academic programmes, the North-East Centre is actively involved in training, research, and development. The infrastructural construction of the Centre is not complete yet, but there's a warm welcoming ambience and the greenery around the campus is not perfectly manicured yet serene.

With this newsletter we have tried to provide a glimpse of those who roam the ISI-NE campus, the people and their thoughts. We hope we have captured an essence of the intellectual culture of ISI and future editions will improve upon this.

Foxtail bloom captured at the Orchid Research Centre, Tipi, Arunachal Pradesh, May 6, 2018

From the Head's Desk

Prof. Tapan Chakraborty

I congratulate the student team and the Newsletter Committee to have successfully put together the first volume/issue of the Newsletter from the North-East Centre of Indian Statistical Institute. This marks the beginning of a long journey. The beginning makes it a special event and will be embraced as a remarkable achievement in the history of the youngest Centre of Indian Statistical Institute. I encourage workers and students to strive in all their creative endeavours, stay inspired and continue the good work. The journey of 2020 so far has been challenging in many ways. I hope the situation will look up soon. I expect that the Newsletter will grow in tandem with the activities of the Centre and will be able to bring together the best of the North-East Centre, with all workers and students sharing their thoughts and contributing to the Newsletter. I hope the Newsletter gains a wider readership within the Institute and outside in the coming years. Good luck!

Epiphytic Foxtail Orchid at the Orchid Research Centre, Tipi, Arunachal Pradesh May, 6, 2018

From the former Head

Prof. Nityananda Sarkar

I am truly happy to note that my beloved students have come up with the idea of bringing out a newsletter. This is a brilliant initiative on their part and I appreciate it wholeheartedly. I sincerely hope that this newsletter will establish itself as a mouthpiece of ideas, opinions, and would also be a platform for showcasing the literary works of our students and workers. I am also sure that it will highlight the academic and scientific works, events and achievements of students and workers of the North-East (N-E) Centre of our beloved Institute.

I find that 'Fox Tale', a brilliant christening to tell the tales of this newest Centre of the Indian Statistical Institute, in its maiden issue has offered an ensemble of literary pieces covering various topics that make wonderful reading both in terms of information, and literary values and aesthetics. The creativity of such kinds by students is always a welcoming feature since this plays a complementary role in their growing up as good and humane citizens of our country. In this respect, bringing out of this newsletter is a small yet important milestone in the annals of this Centre. As the N-E Centre grows from its current stage of infancy in its new campus, I hope that this newsletter would chronicle the blossoming of this newest Centre of the Institute into a vibrant national and international institution of higher learning in Statistics, Mathematics, Economics, Computer Science, and other allied sciences.

On the occasion the of publication of the maiden issue of this newsletter, I send my best wishes to all the students and workers, especially the contributors and the members of the Editorial Board, for this wonderful initiative, and wishes 'Fox Tale' a continued, inspiring, and purposeful journey forever.

Orientation Day

The beginning of the academic year 2019-20 at the new campus of ISI-NE on August 26, 2019

ISI Kolkata and TCS visit

Students at the library of ISI Kolkata January 6, 2020

The week-long visit included lectures by professors at ISI Kolkata, giving a glimpse of their respective fields and how statistics is relevant to them. The talks were thought-provoking and gave an overview of the broad field of statistics. The students spent a day at TCS Kolkata to see first hand how the corporate world works with data and generate insights.

Participants of the training programme

Training Programme on 'Official statistics'

A training programme on 'Official Statistics' for 25 Government Officials was conducted during November 25-29, 2019. Topics included Price Statistics; Industrial Statistics; Vital Statistics; Agriculture and Allied Sector Statistics. The programme was funded by the Directorate of Economics and Statistics, Government of Assam.

Independence Day

The workers at the Centre celebrated Independence Day 2019 by hoisting the flag

Republic Day

Celebration of the 71st Republic Day

Participants of the program during a hands-on session

Training Programme on 'National Sample Surveys'

The programme organised during January 20-24, 2020, was attended by 23 Government Officials from various N-E States. Topics include Overall sampling strategies and sample designs adopted in the NSS for various socio-economic enquiries; Issues and challenges in collection, requirements of survey data; Applications of NSS data in government decision-making; Basics of Regression analysis; Use of software R.

Director's visit and plantation drive

The Director, Prof Sanghamitra Bandyopadhyay, visited the N-E Centre on December 20, 2019. It was the first visit after the Centre moved to its permanent campus on June 3, 2019. She interacted and shared her stories with the students. Talking about her career, balancing life and work, and dealing with failure, she left the students inspired to achieve more. The Director inaugurated the plantation drive by planting a *Shorea Robusta* (Sal) sapling. The Head, students' batch, and few workers also planted saplings.

All saplings were provided by Divisional Forest Office, Sonitpur West Division, Tezpur. Click here or scan for more on our campus biodiversity.

Director planting a sapling at ISI-NE Campus

Participants of the Winter School

'Winter School on Mathematics'

A Winter School on Mathematics for Post-Graduate Students of the N-E region was conducted during January 28 - Feb 1, 2020. 19 students were nominated by various universities. Topics include Algebraic Topology; Manifolds; Singularity Theory; Game Theory; Mathematical Modelling of Living Systems. The Winter School was fourth such school since 2016-17.

Achievements

These are some of the achievements of our students during the academic session 2019-20:

- In the first semester Abhishek Bhatia and Avnish Kumar were awarded a cash prize of Rs. 1500 in the form of books for their brilliant performance in the semester examination.
- In the final results, a cash prize of Rs. 1500 in the form of books was awarded to Avnish Kumar and Abhishek Bhatia for their remarkable performance throughout the course.
- Abhinav Baruah, Karishma Chand, Anurima Dey and Kankan Jyoti Das were awarded a cash prize of Rs. 1200 in the form of books for their commendable performance in the entire course.

Farewell

Ms. Arunima Das on her farewell day at the N-E Centre on June 28, 2019

A get together for farewell to Prof. Nityananda Sarkar, Head of N-E Centre on January 27, 2020

Prof. Nityananda Sarkar delivering his farewell speech

Cultural events



The students organised various cultural events

Prof. P. C. Mahalanobis's Birthday

June 29, 2019

June 29, 2020

Celebrating birth anniversary of P.C. Mahalanobis, the founder of ISI, and National Statistics Day on June 29

Outreach Programme

The Centre conducted Outreach Programme for students of the North-Eastern region of India for the third consecutive year during 2019-20. The goal of such programme is to highlight the ongoing academic programmes at the Headquarters (Kolkata), Centres (Delhi, Bangalore, Chennai and North-East Centre at Tezpur) among various educational institutions in the region. Various institutions in Mizoram, Manipur, Meghalaya and Assam have been covered in the past. This year, few institutions in Arunachal Pradesh and Assam were covered.

Jawaharlal Nehru College, Pasighat,
East Siang District,Arunachal Pradesh,
October 17, 2019

Delhi Public School, ONGC, Nazira,
Sibsagar, Assam, January 25, 2020

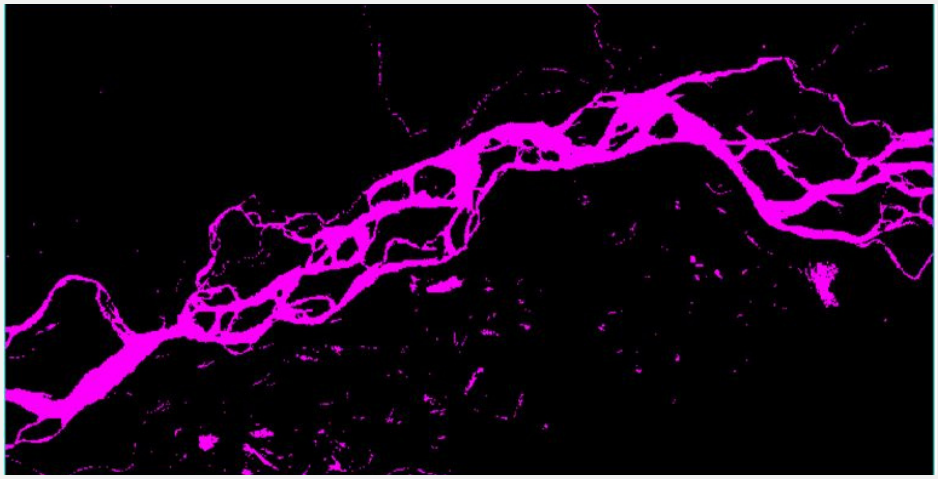
Siang Model School, Pasighat,
East Siang District,Arunachal Pradesh, October 17, 2019

Sibsagar College, Joysagar, Sibsagar, Assam,
January 25, 2020

Kendriya Vidyalaya Pasighat, East Siang District,
Arunachal Pradesh, October 17, 2019

Environmental Application of Remote Sensing

Sanjit Maitra



"Tasselled Cap wetness index band derived from multispectral satellite imagery which extracts Brahmaputra River around Karizanga National Park"

The image shows extracted Brahmaputra River around Kaziranga National Park in Assam, India. Image processing techniques are applied on the NASA's Landsat images which are publicly available at earth explorer (https://earthexplorer.usgs.gov/) repository maintained by the United States Geological Survey(USGS). The Tasselled Cap transformation is computed through the weighted sum of the multispectral bands that can provide the wetness index images as shown above (magenta colour signifies river) to extract the Brahmaputra River [1]. Time series wetness index derived from Landsat images can be used for river bank line change detection which is critical in the region mainly due to the seasonal monsoon affecting the flood plains of the Brahmaputra River including large areas of the Kaziranga National Park.

This work is in collaboration with Ms. Srutiparna Neogi, Centre for Soft Computing and Dr. Kuntal Ghosh, Machine Intelligence Unit, Indian Statistical Institute, Kolkata.

[1] Kauth, R. & Thomas, G.. (1976). The Tasselled Cap -- A Graphic Description of the Spectral-Temporal Development of Agricultural Crops as Seen by LANDSAT. Proceedings of the Symposium on Machine Processing of Remotely Sensed Data; Purdue University, West Lafayette, Indiana http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.461.6381&rep=rep1&type=pdf Description about Tasselled Cap transformation can be found at http://www.sjsu.edu/faculty/watkins/tassel.htm Details about Kaziranga National Park : https://whc.unesco.org/en/list/337/ Open Source Software QGIS for Remote Sensing and GIS : https://qgis.org/en/site/index.html QGIS Tutorials : https://www.qgistutorials.com/en/

Hues of nature

Bishal Saha

A tamed elephant by the banks of Jia-Bharali river. Captured during the students' trip to the Nameri National Park

November 12, 2019

“सात-बहनों” का राज्य: मेरा एक सुखद अनुभव

Arunima Das

सभी पाठक बंधुओ को मेरा नमस्कार | आशा करती हूँ कि इस अतिमारी की स्थिति में आप सभी अपने परिवार सहित सुरक्षित हैं | यह मेरा पहला लेख है इसलिए किसी भी त्रुटि के लिए लिखने के पूर्व ही क्षमा प्रार्थी हूँ |

उत्तर - पूर्व भारत से मेरा प्रथम परिचय मेरे कार्यालय के माध्यम से हुआ | हमारे देश भारत के उत्तर- पूर्व में “सात-बहनों” के नाम से प्रसिद्ध सात राज्यों में से एक में मेरी प्रथम तैनाती असम राज्य के एक बहुत ही खूबसूरत शहर “तेज़पुर” में हुआ | एक महानगर में रहने के उपरान्त तेज़पुर जैसे छोटे शहर में रहने का एक अनोखा ही अनुभव हुआ | तेज़पुर, असम राज्य की राजधानी दिसपुर से लगभग 175 कि.मी. पूर्व की ओर ब्रह्मपुत्र नदी के किनारे बसा एक बहुत ही खुबसूरत प्राकृतिक छटाओं से परिपूर्ण शहर है | तेज़पुर शहर मुझे इसलिए और भी अच्छा लगा क्यूंकि वह एक प्रदुषण मुक्त शहर के नाम से प्रसिद्ध है | वहां पर रहते हुए मुझे काज़ीरंगा राष्ट्रीय उद्यान, नामेरी राष्ट्रीय उद्यान के साथ मेघालय राज्य के शिलांग व चेरापूंजी तथा सबसे स्वच्छ ग्राम मावल्यान्नॉग गांव | अरुणाचल प्रदेश के भालुकपुंग तथा तवांग शहर में घूमने से सुख प्राप्त हुआ | तेज़पुर शहर एक पौराणिक कथा के लिए भी प्रसिद्ध है| शहर के अंदर चाय बागानों का भी लुत्फ़ उठाया | विभिन्न मंदिरो तथा नामघरों से सुसज्जित यह शहर सभी के मन को प्रसन्नचित कर देता है |

साप्तहिक अवकाश के दिनों में श्री गणेश मंदिर तथा ब्रह्मपुत्र नदी के किनारे पर समय बिताना, अग्निगढ़ उद्दयान के मचान पर चढ़ कर पूरे शहर को देखना, दा-परबतिया, जहाज़ घाट, चित्रलेखा उद्यान, महाभैरव मंदिर, पदुम पुखुरी, रुद्रपद मंदिर, पकी घर, बामुनि पठार आदि अनेक स्थानों में भ्रमण का आनंद उठाया है | मेरा कार्यालय कुछ दिनों के लिए तेज़पुर विश्वविद्यालय के एक भवन से कार्यरत था उस अवसर पर विश्वविद्यालय को देखने तथा उनके आतंरिक कार्यक्रमों का आनंद उठाने का भी अवसर प्राप्त हुआ |

हमारे देश के इस उत्तर-पूर्व भाग में रहने का एक अलग ही सुख एवं आनंद है | चारो तरफ हरियाली, बर्फ से ढके पहाड़, नदियां, झरने, चाय बागान सभी कितने मन लुभावने है | भारत-बांग्लादेश सीमांत, भारत-चीन सीमांत जाने का तथा घूमने का सुख प्राप्त हुआ |

यह शहर छोटा होते हुए भी यहाँ के नगर प्रशासन द्वारा सभी प्रकार के सुख सुविधाओं तथा अनुशासन का ख्याल रखा जाता है| वहां से मेरा स्थानांतरण 2019 को कार्यालय मुख्यालय कोलकाता में हो गया | तत्कालीन सहकर्मियों तथा अधिकारीयों के साथ मेरा बहुत ही अच्छा अनुभव रहा | आशा रखती हूँ मेरे इस छोटे से प्रयास से शायद आपको भी एक न एक बार हमारे देश के इस “सात-बहनों” के राज्यों में भ्रमण करने की इच्छा को अवश्य बलवत करेगा |

Hues of nature

Bishal Saha

A day's end at the
ISI NE campus

March 13, 2020

Bayesian Geoadditive Regression Modelling of Childhood malnutrition in Eastern region of India

Sumedha & Avnish Kumar

In our study, our focus was particularly on the influence of the child's age, mother's age at birth and mother's Body Mass Index (BMI), and spatial influences on chronic undernutrition in eastern region of India which includes states of Bihar, West Bengal, Jharkhand, and Odisha. Conventional parametric regression models are not flexible enough to cope with non-linear effects of these continuous covariates and can't flexibly model spatial influences. We investigated the impact of such covariates on malnutrition with flexible geoadditive models. These models can account for non-linear covariate effects and small-area regional effects while simultaneously analysing the usual linear effects of some covariate within a unified, semi parametric Bayesian framework for modelling and inference.

Modelling the facets with use of Bayesian Geoadditive Regression method of three separate response variables of malnutrition; stunting, wasting and underweight, we determined a distinct regional pattern of malnutrition that is not adequately expressed by just relying on provincial fixed effects. The non-linearity in certain effects has also been captured. Malnutrition is found to be spatially clustered since it follows a spatial pattern, could be the result of rudimentary factors such as climate that affects the quality of nutrition, access to important infrastructure, regional and economic opportunity, education and awareness, etc.

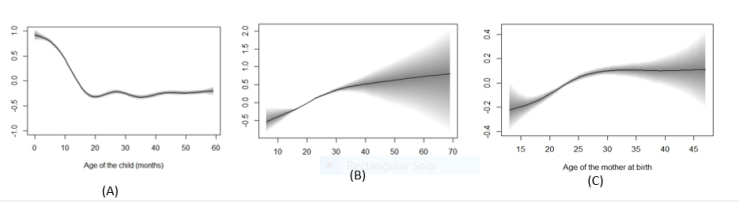
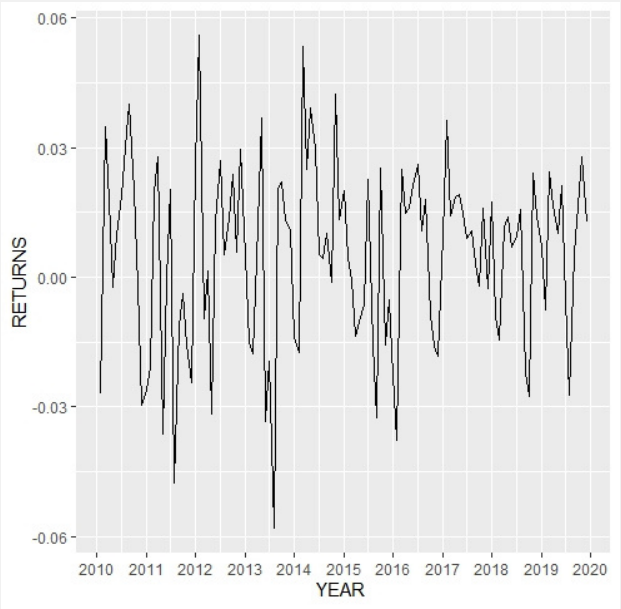


Fig. 1: Posterior means of non-parametric effects in stunting for (A) Child's age, (B) Mother's age, (C) Mother's age at birth for Gaussian semi-parametric model

Fig. 2: Colored(darker region indicated better nutritional status) maps of Eastern region of India, showing posterior means of structured (A), unstructured(C) spatial effects in stunting for Gausian semiparametric model and map of Eastern region of India (B)



Returns of Nifty Services Index

A study on the effects of macroeconomic variables on returns of Nifty financial Services

Gunjan Nandi

Stock markets play a vital role in the financial sector of every economy. In this project, an effort has been done to study the relationship between the macroeconomic variables, consumer price index (CPI), money supply (based on M3), real broad effective exchange rate, US Dollar exchange rate, short term interest rate (91-day treasury bill) and its impact on returns of Nifty financial services index of National Stock exchange (NSE). To study the relationship we use a single equation multivariate time series model. From our analysis of data over a period of ten years (2010-2019) we find that among the macroeconomic variables US Dollar exchange rate and real broad effective exchange rate seem to have high influence and have a significant impact on returns of Nifty financial services.

Unfair world

Abhinav Baruah

"She's nice because she's rich. Hell, if I had all this money I'd be nice too!" These words by Chung-sook, one of the lead character from the Korean movie Parasite, reflects the vast economic and social advantage that the rich and affluent poses. Director Bong Joon Ho's Parasite did not only make Oscar history by being the first non-English movie to win Best Picture award but also brought the subject of social inequality and class divide to mainstream popular culture. According to Oxfam, in India, the bottom 60% population holds only 4.8% of the nation's total wealth while the top 1% holds more than 50% of the wealth. To realize these numbers, one doesn't necessarily need to read academic literature but our life around us provides perfect instances. The labourers working for the construction of a University will probably never get the chance to send their children to that University; perhaps not even any school? The danger of inequality lies in its multidimensionality. Socio-economic inequality further leads to political inequality. Wealthy elite will always try to effectively control the political system of a country. A nation where the political voices of the poor remain muted is as worse off as an autocratic regime. Further legal costs would put justice beyond the poor man's reach. Thus without socio economic equality, equality before the law is just empty words. French economist Thomas Piketty in his book Capital and Ideology points out that throughout history, the search for distribution of wealth acceptable to the majority of people has been a recurrent theme. As societies distribute income and wealth in a more egalitarian way, equality becomes an idea of social change and drives economic progress. But equality need not imply literal equality. Aristotle identified justice in treating equals equally and unequal unequally, thus paving the path for distributive equality. The government should take care of the special needs of the socially disadvantaged and vulnerable, i.e. tribals, physically disabled, scheduled castes, etc to create equality of opportunity and thus further reducing socio-economic inequality. This is not only an essential prerequisite for social justice but a significant need for a robust democracy. When it comes to fighting inequality, the challenge extends much beyond just ensuring wealth equality. Especially in a developing nation like India, social complexities and diversities further add to the challenge. Gender, caste and regional disparities influence at multiple levels, ranging from individual to community, national, or global level. Thus India needs not only fast development but inclusive development that gives voice to the oppressed and silences power abusers.

Bridge of Tranquility

Harsha Jyoti Das

Artwork depicting the view of sunset from the bridge on the way to the ISI N-E Centre

Twenty Twenty Tipping Point

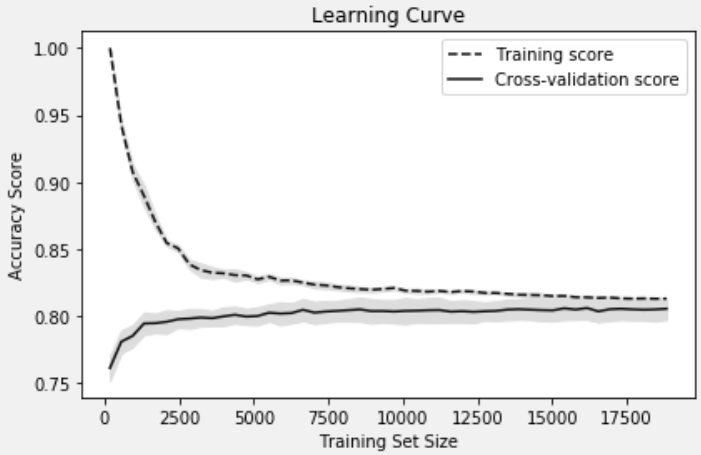
Darpa S. Jyethi

Unforgettable turn of Twenty Nineteen
impending pandemic unforeseen.
Wuhan ill-famed, COVID-19 notoriously fabled
rolled out of cryptic Red Dragon rapid.
Akin to SARS-CoV-1 epidemic
spawned SARS-CoV-2 historic.
Maligned the flying mammal
infected humans, cats-big and small.
Borne on respiratory droplet
proliferate from swarming spot.
Cough, fever, runny nose, throat sore
aching body, shiver down the spine.
Pasty lungs gasp for oxygen
immunity grappling with invading antigen.
Sanitiser, shield, mask, social distancing
borders sealed, planes ceased flying.
Hand washing etiquette heeded never before
liquid soaps, disinfectants galore.
Thermal scan, self-isolation, quarantine safeguard
dearth of ventilators, PPEs lifeguard.
Business shut, curfew imposed
public activity strictly banned.
Classes online, schools closed, hurray! bunk
alas! playgrounds desolate, exams postponed, yay! who flunk.
Millions infected, several hundred thousand deaths
vaccine obscure, contact tracing in swaths.
Stay home, flatten the curve
open or close! that's the debate.
Incubation up to day fourteenth
caution, new cases umpteenth.
Asymptomatic as fearsome as symptomatic
Hydroxychloroquine handy in panic.
Respirators contain outbreak?
Contagion unabated every day's newsbreak.
Community transmission uncertain, comorbid alert
the Corona sobriquet!
Test, Test and Test
the virus is on an easy quest.
Reproduction number five point seven
doubling time two to three days, herd immunity when?
Viral diagnostic test, antibody test
false positives and false negatives wrest.
Where's the silver lining in oblivion
in the cleaner environment for certain.
Takeaway from this lockdown giant
Self-restraint.

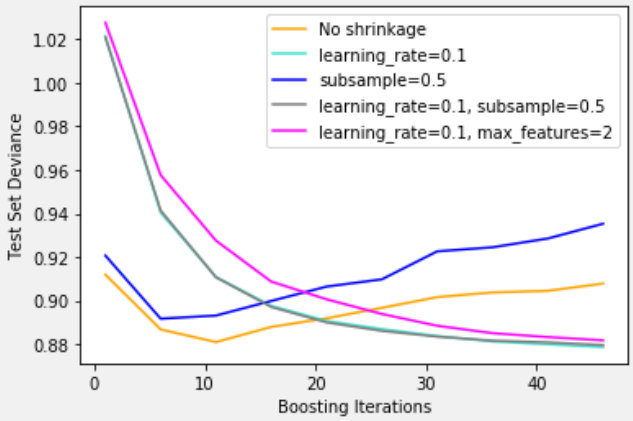
Risk Modeling for Credit defaulters using Machine Learning Approach

Shyamalendu Manna

Credit risk predictions, monitoring, model reliability and effective loan processing are key to decision-making and transparency. In this work, we built binary classifiers based on machine and deep learning models on real data in predicting loan defaulters. Some variables have been generated out of the data to understand more about the patterns of default and for building the model in predicting credit default. The feature engineered variables are used for model building. The Gradient Boosting model has the maximum score matrices value. After tuning hyper parameters its predicting accuracy increased from 80.30% to 80.58%. The benchmark model was logistic regression which is most commonly used for modelling. But here Adaboost, Gradient Boost, Random Forest, Voting classifier and weighted models have more accuracy than Logistic Regression model. Gradient boosting and weighted voting classifier models performed better than other pre-specified models with Gradient boosting model being the best out of the two. Feed Forward Neural Networks are known to achieve a higher accuracy with increasing layers and other changes in network topologies. In this project, an attempt was made to do the same by using a Stochastic Gradient Descent (SGD) optimizer, which tries to minimize the loss function iteratively and is generally much quicker than the normal gradient descent optimizer.



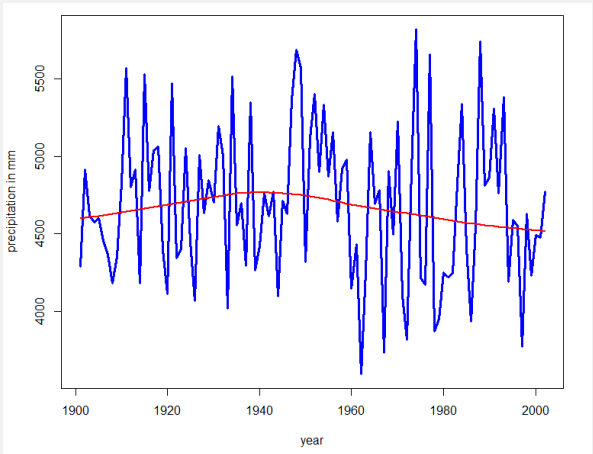
Learning curve of tuned gradient boosting classifier model



Cross validation graph on different levels of subsampling

Relationship of El Niño–Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) with the Precipitation in Assam from 1901-2002

Roshan Kumar Sah



Precipitation trend in Assam 1901-2002

Numerous investigations have been done to identify the relationship of Indian summer monsoon rainfall with ENSO and IOD. In this project we have found that there is no significant trend as well as change point in the precipitation series in the given years for Assam. There is a significant correlation between the precipitation series in Assam and the IOD, contrary to that with ENSO.

Artwork by Anurima Dey

Punarbhava-Moksha

Anurima Dey

brahmanyaadhaaya karmaani sangam tyaktvaa karoti yah
lipyate na sa paapena padmapatramivaambhasaa||

(He who offers all actions to God, without attachment, remains untouched by sin, just as a lotus leaf is untouched by water and mud.)

The lotus flower, inspired by the concept of "rebirth" used in ancient Egyptian art, symbolises rebirth here. Lord Buddha in Gandhara art has been depicted to be seated on a Lotus, as well as Lord Brahma, Shiva and Vishnu with their wives are shown seated on the flower. The depiction known as Padmasana (the Lotus seat) is one of the best for meditation and increases concentration. The Lotus flower is known for its unique ability to grow in muddy earth and rise through water to sunlight which can be thought of as an inspiration to humankind to rise above all the sufferings and hardships and reconnect with the light that surrounds us. The calm, meditating woman here is a reincarnation of Buddha himself in a feminine essence, symbolising Moksha, attained only after offering all the actions to the divine.

পপীয়া তৰা

Dhritiman Das

মনে কি বিচাৰে ,তুমি নুবুজিবা
নে বুজিও অভিনয় কৰিছাঁ!নাজানো।
তোমাৰ আশাৰ টোপোলাটো
একেলগে দাঙি লোৱাৰ
প্ৰতিশ্ৰুতি দিব
মন যায় মোৰ।
স্বাৰ্থপৰ এই পৃথিৱীত
তোমাৰ সপোনবোৰক
নিজৰ সপোন কৰিব
মন যায় মোৰ।
কিন্তু চাওঁতে চাওঁতে
সময়ৰ শেষ আহিল।
কব খোজা কথাবোৰ
কোৱা এ নহল,
কবিতাৰ ভাষাৰ কথাও
তুমি কিয় যে নুবুজা?
কিমান বাৰ যে কব চাইছিলো
অবুজন তুমি,বুজি নোপোৱা।
বহল মনটোক কিদৰে বাধা দিছোঁ
নাজানো মই,
বিশাল সাগৰবোৰৰ দৰে
যদি মই ও
স্বাধীনতা পালোঁ হয়,
জীৱনৰ অৰ্থ বুজিবলৈ টান নহল হয়
কোৱা যেনিবা নহলেই ,তথাপিও
মৃত্যুৰ পিছত হলেও
তোমাৰ আশা পূৰাবলৈ
তোমাৰ সন্মুখেৰে পাৰ হৈ যাম মই
পপীয়া তৰাটো হৈ।

Time

Abhinav Baruah

Sat down on the veranda
and saw time pass by.
I asked time to stop,
Catch a breath, relax.
Time my friend,
Why in such a hurry?
Where are you heading?
Who is waiting?
What is your final destination ?
You intrigue me with questions unanswered.
Time, Sit down with me; Let's talk.
Talk about nostalgia,
Answers to the past,
Questions of the future.
You can't stop I know,
But meet me when you return,
I will wait here.
Or will you change?
Betray me like the seasons?
Leave me stranded alone, hopeless.
Promise me you won't.

Gender Equality: Crucial Growth Engine of Global Economy

Avnish Kumar

Gender equality has a fundamental relationship with whether or not societies and economies thrive. Economies having gender equality offer better socio-economic opportunities for women and also grow sustainably. The development of women, who comprises nearly half of the world population, has a huge bearing on growth, competitiveness, and future readiness of economies.

Women play a vital role in the development and progress of society. Without them, a developed and prosperous society cannot be imagined. There is a famous saying by Brigham Young that - 'If you're educating a man, then you are educating only one man but if you are educating a woman, you are educating the whole generation.' Throughout history, the central role of women in society has ensured the stability, progress and long-term development of nations. Undoubtedly, women are the foundation of the basic unit of society- the family. Even in traditional roles, they show great intelligence, innovation, skill, hard work, and commitment. If we can harness these attributes effectively, the growth of any nation can be more inclusive and equitable.

The latest research suggests that the participation of women in the country is beneficial not only at the family level but also at the social and economic level. Although women have been compelled to live in the walls of the home for centuries, their abilities have been constrained, but despite this fact, whenever they were given a chance to advance in any field, they have proved themselves. There are no such areas in the world in which women have not excelled and have not shown their potential and abilities in it. Hence, women's empowerment is needed for any country to grow at a faster pace.

A major requirement for achieving women's empowerment is the absolute need for change in the mindset of people. There is a tendency among people and also certain societies to treat women as being inferior to their male counterparts. There should be an end to such obnoxious thinking if countries across the globe have to advance in all fields since women constitute nearly half the population in the world. Globally, women have lesser opportunities for economic participation, less political representation, less access to education and greater health and safety risks than men. This is a dangerous state of affairs for any society. By denying the opportunities to women to realize their potential is a waste of human capital and hinders the economic progress of any nation. Guaranteeing the rights of women and giving them enough opportunities to reach their full potential is critical not only for gender equality but also for meeting a wide range of international development goals. Empowered women can contribute to their families, societies, and countries, thus creating a ripple effect that benefits everyone. Humanity cannot progress when the potential of half of its population remains untapped. Hence, by coalescing the skills of both men and women at an equal level will add immensely to the UN's Sustainable Development Goals (SDG).

According to the Global Gender Gap Index 2020, which is based on four dimensions; Economic Participation, Political Empowerment, Educational Attainment, and Health and Survival, gender parity score stands at 68.6%. Globally, in terms of political representation, women have got only 25% of available positions, also just 21% at a ministerial level and no representation in nine countries. In terms of economic representation, only 55% of women labor force participation as compared to 78% of men. This report reveals that at this pace gender parity will not be attained for 99.5 years. At this point, the goal of global, national and industrial leaders should be building more inclusive economies and for this gender parity across politics, education, health, economic participation are critical. Various research reports suggest that on getting equal opportunities, women brought change not only among people but also in the nations because women give a new perspective on various issues and can take courageous decisions.

According to PIIE's (Peterson Institute for International Economics) study, the presence of more female leaders in top positions of corporate management correlates with increased profitability. This survey of 21,980 publicly traded companies in

91 countries demonstrates that Institutions, where there are at least 30-percent of women in the leadership position have registered a six percent increase in profits. Women in the top position have a trans-formative style of leadership because they are hardworking, versatile, unbiased decision- makers and have a holistic approach to work. A study suggests that out of 500 fortune companies, in which the number of women in top positions is more, they are more profitable than others. IMF research has showed that if the participation of women in the labor force is increased to the same level as men, then India's GDP can increase by 27%. The economy and the female workforce of any country are directly related to each other.

Women are not being given fair participation in the workplace and other areas in terms of salary or opportunities, and very few numbers of women are being given a chance at the top positions in the corporate world. The reason for this is not a lack of their abilities, but a prejudice towards woman, because patriarchal thinking and misconceptions in our society for many centuries have interrupted the progress of women in all fields. These unfair treatments against women are affecting the economy. In such a situation, discrimination against women in corporate should be eliminated. This initiative will create enthusiasm, new thinking, better decision making and innovation in the corporate world. When women and men work together, studies show that they come up with better solutions, which is the basic premise of diversity in the workplace.

According to the study of Zenger-Folkman,women are rated higher in 12 of the 16 competencies for outstanding leadership. In all these, women are rated as excelling in acting with resilience, driving for results, taking initiative, practicing self-development, and showing integrity and honesty. The reason is that qualities like congeniality, confidence, integrity, honesty, empathy and innate nature make women powerful leaders. In such a situation, there is a need to understand the contribution of women leading in business and other fields. Many research reports confirm that women are more proficient in leadership-skills and performance than men. Despite this women are not being given opportunities at top positions in the corporate world. Gender inequality is not only a pressing social and moral issue but also a critical economic challenge that requires our undivided attention. Unless we tap the full economic potential of women, where half of the working-age population, the global economy will suffer. A McKinsey Global Institute report finds that if the woman gets equal participation at the workplace $12 trillion could be added to global GDP by 2025 ("best in region" scenario), which is more than four times that of India's current economy. In a "full potential" scenario in which women play an identical role in labor markets to that of men, as much as $28 trillion could be added to global GDP by 2025. The UN report says that women's economic empowerment increases productivity, increases economic diversity and brings income equality. Their participation in the economy has wider benefits as they generally devote more of the household budget to education, health, and nutrition than men. Despite this, female participation in the workplace today is extremely low.

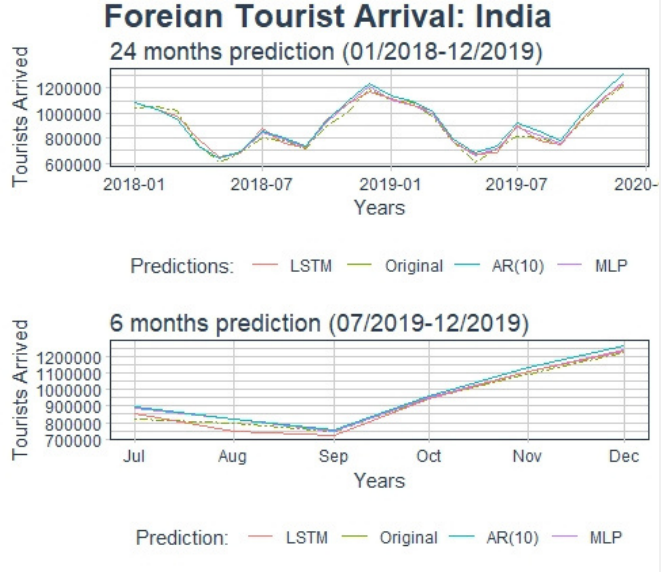
To achieve gender parity at work, four primary issues are to be addressed: digital and financial inclusion, equal access to education, legal protection, and less unpaid care work. This can improve women's employment opportunities and enable them to make smarter investments. Providing a safe and secure place for women to work productively and contribute to society is a key factor in promoting gender equality.

If we want to bring prosperity in society, then we have to use the unprecedented potential of women, for this, they have to be encouraged. Women are capable of breaking the cultural and structural obstacles and they know when and how to deal with problems. The need is just to give freedom to their dreams. Women need to recognize their potential and play their role in the development of the country and society along with their families.

For the prosperity of the country, we need powerful and strategic leaders, who can lead people in the right direction; in this case, women can be a better option. If given a chance, they will demonstrate their abilities and develop a new perception in society. If we want the global economy to prosper, we must have such domestic policy and enact structural reforms that will empower women. This change is possible only when we all stand together and work with a positive attitude.

Forecasting Foreign Tourist Arrival in India: Neural Network vs. Time Series Models

Anurima Dey & Shreyasi Dev



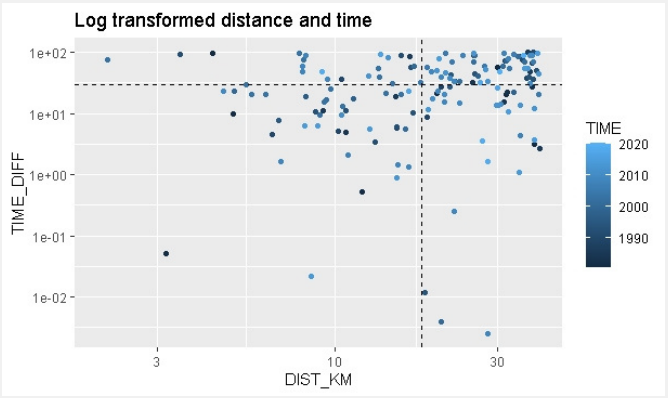
Prediction of Foreign Tourist arrival in India

The main objective of the project was to compare the performance efficiency of neural networks models namely Multilayer Perceptron (MLP) and Long Short Term Memory (LSTM) relative to linear Auto Regressive (AR) time series model for foreign tourist arrival in India. We have used two different forecasting windows of 6 months and 24 months to find out how well behaved our model performances are for short term and long term prediction. To ensure that the models are accurately compared, we carried out all three modelling on stationary time series. First, we have modelled the time series which turned out to be a AR(10). Next we have decided upon the structures our MLP model (9:2:1 and 9:1:1 for 24 months and 6 months prediction respectively) by choosing the minimum number of neurons through lowest MSE criterion. To maintain a parity in models we have used similar architecture in LSTM. On the basis of two well - known performance matrices namely RMSE, MAPE, our findings suggested that for both the time horizons, 6 months and 24 months, the ANN models namely LSTM and MLP have outperformed the naive Auto Regressive time series model.

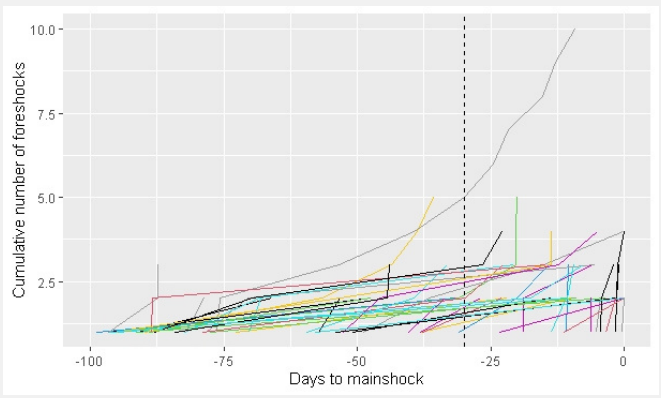
Foreshock Activity and Seismicity Analysis of North-East India : A Statistical Seismology Approach

Kuldeep Doley & Prakarti Walia

The northeastern region of India is most vulnerable to earthquakes as it lies in the Zone V, the highest seismicity scale given by the Bureau of Indian Standards. We studied the seismicity of the region by analyzing the foreshock occurrence and its prevalence in the region in the last 40 years. This helps us in estimating if there is a significant foreshock occurrence, so that we can find relationships between foreshocks and mainshocks to mitigate the risk of a major earthquake. The project was carried out on earthquake event data from the International Seismological Centre (ISC) event catalogue.We separated all the M >= 5 events and obtained isolated events after excluding some events based on some predefined space time windows. After comparing these events with the original dataset, we get a series of foreshock-mainshock sequences. The cumulative number of foreshocks for each sequence are plotted against the number of days between the foreshock and mainshock. From this we infer that there is an increase in foreshock activity roughly 30 days before and 15 kms around each mainshock.



The distance and time of all the events within 100 kms of the mainshocks



The cumulative number of foreshocks before a mainshock

Fractals - Paradoxes of Patterns

Gunjan Nandi

Art and Mathematics are widely known to be connected, as in our day to day life we often come across complex geometric repeated patterns in our computer screen saver to trending designs and prints, architecture used in sculptures, with a fine structure and infinite nesting levels. These patterns and shapes that we come across are known as fractals. A fractal is a geometric object, a never ending pattern that repeats itself in the same structure on different scales or timings. The term fractal comes from the Latin word fractus meaning broken or fragmented.

Fractals are known to have irregular shapes which are strange, distorted may have undue outgrowth, tentacles or protrusions. Thus fractals possess fractional dimension unlike classical figures of Euclidean geometry. Fractals also exhibit similar patterns at increasingly small scales called self-similarity. If we enlarge any small portion of a fractal we will be able to obtain the original whole shape in it. A keen look on our environment would make us realise that nature is filled with fractals - in the tiny branching of our blood vessels and neurons, branching of trees, the shape of lightning bolts, coastlines, mountain ridges and river networks.

Sea waves of Bay of Bengal at Puri Beach, June 10, 2014

Branching of a tree at ISI-NE, Feb 20, 2020

The concept of fractal geometry can be used to study numerous phenomenon of physical objects. It has been used to analyse the rhythm of heart and model blood circulation and also to understand the behaviour and turbulences of stock markets. The stock market can itself be considered as a fractal where frequent rises and falls take place with occasional huge crashes. Fractal geometry has also become an important part of computer graphics as very complex patterns can be generated. Fractals patterns and images are so intriguing and soothing to the eyes that it can be a source of relaxation too. Thus the concept of fractals are immensely useful in an increasingly wide variety of fields and opens up the scope of improving our precision of understanding patterns and shapes.

- https://fractalfoundation.org/resources/ what-are-fractals/
- https://www.britannica.com/science/fractal
- https://encyclopedia2.thefreedictionary.com/fractals
- https://www.thefreelibrary.com/FRACTALS

Recommending User-Specific Quotes using NLP

Bishal Saha & Harsha J. Das

The objective of our project was to recommend relevant quotes for the user based on their questions. We have used NLP techniques BOW, TF-IDF and Doc2Vec to extract the text feature and have used Cosine Similarity to measure the similarity between the question asked and database of pre-existing quotes. The results differ for both the models, i.e., TF-IDF and Doc2Vec, TF-IDF gives us better results as compared to the Doc2Vec model. Lets ask **"How to be successful in life?"**.

The results for the two models are:

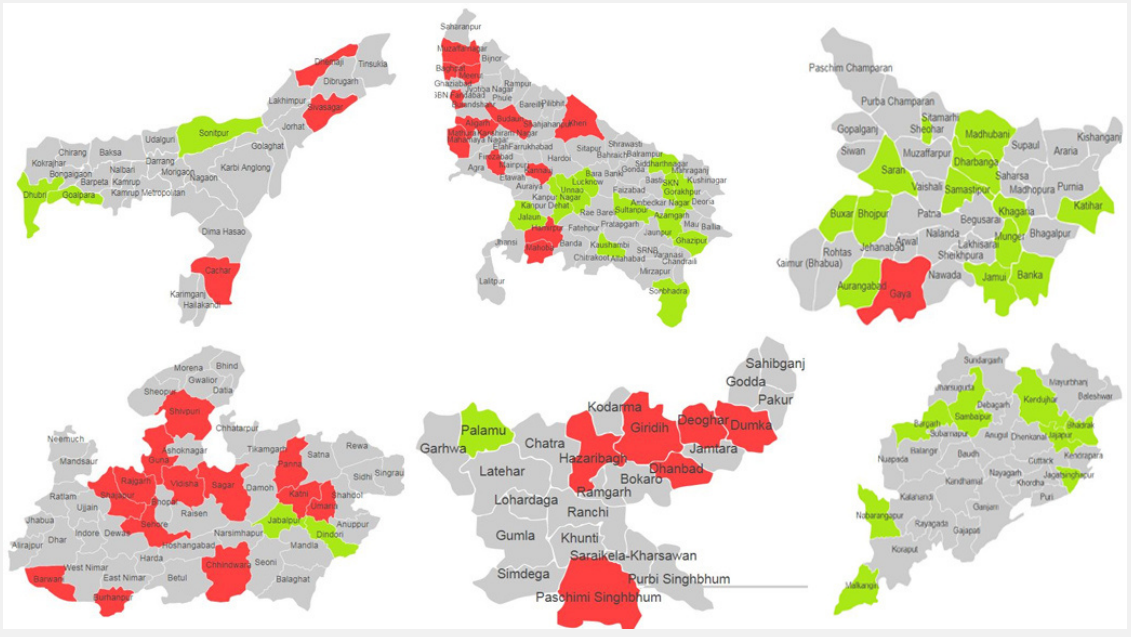
TF-IDF Model: Success follows in doing what you want to do. There is no other way to be successful. If people knew what they had to do to be successful, most people wouldn't.

Doc2Vec Model: Life gives us the greatest opportunity to serve and be happy.

Vulnerability mapping of undernutrition in newborn children using Machine Learning techniques

Akhilesh Kumar and Abhinav Baruah

Despite having enough food production, India suffers from a 'hidden hunger' due to insufficiency in fulfilling the nutrient requirement of its population. In order to address the issue, through our project, we applied machine learning techniques to predict vulnerability of Indian districts to undernutrition among newborn children. We used the Annual Health Survey (AHS) of India 2012-13 data, to classify Indian districts into "Low" or "High" levels of vulnerability based on social, demographic and health variables. We used Local Outlier Factor to detect and remove outliers in our data and then applied classification techniques like Linear regression, Logistic regression, KNN, Decision Tree, Random forest and AdaBoost. We also explored the usage of Linear Discriminant Analysis (LDA), dimensionality reduction technique to build a better model. Based on Accuracy, Sensitivity and F1 score we chose Linear regression, KNN, Random Forest as our best performing classifiers. Further we build our final ensemble classifier which takes the predictions from the top three classifiers as input and selects the best prediction based on majority voting criteria. Finally we visualized our predictions as vulnerability heatmaps of each district. Our final classification model was not only statistically robust but also practically deployable and capable to a large extent in explaining trends of vulnerability to undernutrition among newborn across all districts of India.



Summary of the predictions

From the Archives of Corona Virus

Sumedha

According to the World Health Organization (WHO), viral diseases continue to emerge and represent a serious issue to public health. In the last twenty years, several viral epidemics such as the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002-2003, H1N1 influenza in 2009, the Middle East respiratory syndrome coronavirus (MERS-CoV) first identified in Saudi Arabia in 2012 have been recorded. Most recently, Ebola and Nipah viruses were also recorded in 2014 and 2018 respectively.

Human coronaviruses were first characterized in the late 1960s which are mainly responsible for a substantial amount of upper respiratory tract contagion in children. The tale of human coronaviruses began way back in 1965 when Tyrrell and Bynoe (Cultivation of viruses from a high proportion of patients with colds), described the first HCoV, designated as B814, found in human embryonic tracheal organ cultures of an adult's respiratory tract having common cold. The presence of such an infectious agent was detected by inoculating the medium from these cultures intranasally in human volunteers after which colds were produced in a good proportion of subjects, but these scientists failed to grow the agent in tissue culture at that time.

After a small period, Hamre and Procknow (A new virus isolated from the human respiratory tract) succeeded in growing a virus with very unusual properties by tissue culture from a similar sample obtained from the patients with symptoms of cold. They named both B814 and Hamre's virus as 229E. From further studies, it was found that these viruses were sensitive to ether and hence for infectivity required a lipid-containing coat.

Later, in the late 1960s, a group of virologists, under Tyrrell, working on human strains and of animal viruses which included a study on bronchitis virus, mouse hepatitis virus and transmissible gastroenteritis virus of swine were indicated as morphologically same when seen through electron microscopy. This group of viruses thus found were named Coronavirus. Coronaviruses (CoVs) are medium-sized positive--sense single-stranded RNA viruses, characterized by a club-like shape with spikes coming out of their surface and a unique replication strategy. Generally, the CoV virions are spherical in shape with an approximate radius of 63 nm as depicted in recent studies by cryo-electron tomography and cryo-electron microscopy. The spikes are a defining feature of the virion and give them the appearance of a solar corona, which is the rarefied gaseous envelope of the sun and other stars, giving them the name, coronavirus.

In the first three decades after the discovery, two types of human strains namely OC43 and 229E were largely studied considering the ease of studying these strains. In the case of OC43, which adapted to grow in the brain of a young mouse, subsequently resulted to be close enough to the mouse hepatitis virus whereas, the strain 229E, from the clinical sample, was grown in tissue culture directly. These two viruses showed periodicity with the potentiality of causing large epidemics at 2 to 3-year intervals. Like with other viruses that affect the respiratory tract, reinfection was common. The infection could occur at any stage of life but was most common in children and elderly people.

According to the ongoing research using serological techniques, a large amount of information regarding the epidemiology of the human respiratory coronaviruses has been collected, and it was found that the infections tend to happen more in the winter and spring as compared to summer and autumn. It was also found by some epidemiologic and volunteer inoculation studies that the respiratory coronaviruses were largely related to various respiratory illnesses, the predominant one associated to this kind of infection was upper respiratory infection with cases of pneumonia in infants and had the potential of producing asthma exacerbations in kids as well as chronic bronchitis in the elderly.

Given the enormous variety of animal coronaviruses, research for the exploration of pathogenicity and epidemiology of animal coronaviruses is growing rapidly. Coronaviruses were considered to cause multiple diseases in animal species, including dogs, rabbits, rats, mice, pigs, etc. The study of infection of this virus in animals included disorders such as gastroenteritis, hepatitis, and encephalitis in mice, pneumonitis in

rats, etc. As the variety of mammal viruses was large, it marked no surprise when a Severe Acute Respiratory Syndrome also known as SARS (SARS-CoV), appeared in 2002-2003 as a coronavirus from southern China and got spread throughout the world with perceptible speed. It was also found that this virus grew fairly easily in tissue culture, making it easier and quicker for the genome sequencing. Whereas Middle East Respiratory Syndrome (MERS-CoV) which got spread in the Middle East was a zoonotic virus. The route of its transmission from non-human to human is not completely understood.

During the outbreak in 2002-2003, the SARS infection was reported in 29 countries in Asia, North America, South America, and Europe and the number of overall infected were 8098 identified individuals, with a total of 774 SARS-related fatalities. After further study about the occurrence of this infection, the findings suggest that this occurs mostly because of the exposure through their occupation to a SARS-like virus that frequently caused an asymptomatic infection.

The latest coronavirus that first appeared in Wuhan, Hubei, China in December 2019 seems to be hugely contagious and has quickly spread in almost the entire globe hence was recognized as a pandemic by the WHO on 11th March 2020. Coronavirus Disease commonly known as COVID-19 has been reported to have spread across countries and territories. The virus has approximately infected 650,000 people and killed over 30,000 people globally as of 29th March 2020, according to the World Health Organization. India has reported having more than 1000 cases, with approx. 179 fatalities. It is thought-provoking that the virus seems to have originated from bats further moving into other mammalian hosts - the Himalayan palm civet for SARS-CoV, and dromedary camel for MERS-CoV before reaching out to humans. As per the International Health Regulations (IHR, 2005), WHO declared this outbreak as a Public Health Emergency of International Concern (PHEIC) as it has reportedly spread in 18 countries with around 4 countries reporting human-to-human transmission through close contact or via respiratory droplets produced when an infected person coughs or sneezes. It is reported that people may also get infected by touching the contaminated surface and then their faces. Common symptoms include fever, cough, and shortness of breath. India, in its measures to combat the economic impact of the fast-growing coronavirus, is working on a set of policy measures which includes some cash transfers to workers in the informal sector. Various efforts are being made to avoid spreading which include travel restrictions, workplace hazard control, quarantine, curfews, etc.

India's economic growth could undergo up to half a percentage point in FY-21 because of the disruption due to the outbreak of COVID-19. Sectors like travel, hospitality, aviation, and trade will encounter the first loss of severe travel and activity curbs imposed by governments across the world. China is likely to experience a contraction in GDP in the first quarter of 2020. Europe and the US are also expected to slip into recession by July.

The crisis due to the spreading of COVID-19 around the world is causing deaths and major disturbance to the global economy and requires global cooperation among governments, international organizations and the business community, which is at the center of the World Economic Forum's mission as the International Organization for Public-Private Cooperation. This Forum has created a global platform, COVID Action Platform with the support of the WHO and is made open to all businesses and industrial groups, stakeholders, interested to integrate and inform joint action.

The logo of the Newsletter is a sketch of a stem of the Foxtail Orchid. It is designed by Prakarti Walia using Adobe Illustrator.

Panoramic view of the permanent campus of the ISI N-E Centre on the first day, June 3, 2019

Editors

Kuldeep Doley, Prakarti Walia

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Newsletter Committee
Indian Statistical Institute
North-East Centre
Punioni, Solmara, Tezpur, Assam 784501
foxtale@isine.ac.in
http://www.isine.ac.in/