

March 2022

Welcome Message from Editor and Team!

Welcome to Winter 2022!

We welcome you to March issue of IEEE Newsletter, Toronto section.

In this issue, we are celebrating National Engineering Month, along with the entire Canadian engineering community. **(Page 5)**

Enjoy reading article “**Operationalization of Machine Learning Models in Large Enterprises**”. **(Page 3)**

Meet **Salah Sharieh** in our IEEE supporters section. Enjoy and appreciate his contributions to IEEE. **(Page 2).**

For the section upcoming events, please visit [New Events page](#).

You can find newsletter’s [previous issues here](#). You can explore our [Library](#) to access links to various newsletters, resources and chapter activities.

By launching this newsletter, we intend to cover IEEE achievements and success stories specific to the Toronto area.

If you have any questions, suggestions, or concerns, please address them to the editor; Fatima Hussain at fatima.hussain@ryerson.ca. We hope to hear from you, and we welcome your feedback!

Meet Our Distinguished IEEE Supporters

Dr. Salah Sharieh

Dr. Salah Sharieh is a senior technical Innovator with extensive experience in business, technology, and digital transformation. Salah delivered high-profile solutions and provided vision and leadership to several industries, including financial, telecommunication, and high tech, as well as mentored professionals and students.

Working at RBC, he led the delivery of the first Developer Portal in Canada, enabling API economy and allowing external Developers across industries to collaborate and innovate. As Technical Head with BMO, Salah's technical and leadership skills managed his team to deliver several high-profile initiatives such as the first mobile account open in Canada, the first bio-metric touch ID solution, and the first integrated tablet solution for investment everyday banking.

Salah is a Yeates School of Graduate Studies member at Ryerson University, where he supervised Ph.D. and Master's students. One of his research areas is the new role of CIOs in the new Digital Economy. In addition, he taught several courses in areas like security, algorithms, and networks.

Salah holds the degree of Doctor of Philosophy from McMaster University. He has more than forty-five peer-reviewed publications and has contributed to several books. In addition, he is a technical reviewer for several journals and conferences. He is a member of the CIO Association of Canada, IEEE, and ACM. In addition, Salah led the National Occupation Standards for Cyber Security.

Salah gives talks and publishes his research in IEEE conferences. Salah is active in the research community, and several organizations have recognized his work. He has been recognized as Canada's Tech Titan: Top 19 of 2019. His work several won awards: Celent Model Bank Award for API Strategy, Financial Institutions of the Year at the 2018 Canadian FinTech & AI Awards,



2019 Digital Transformation Awards, presented by IT World Canada, in the Large Private Sector Business Transformation category, and Celent Model Bank Award in 2015, Award Excellence in Digital Banking.

Operationalization of Machine Learning Models in Large Enterprises

Shikhar Kwatra (IBM), Utpal Mangla (IBM)

ML operationalization (ML Ops) involve a cross matrix collaboration of multiple personas involved in the process of model conceptualization to productization. ML Operationalization overlays paradigm of DevOps on Model Lifecycle management process (CRISP-DM).

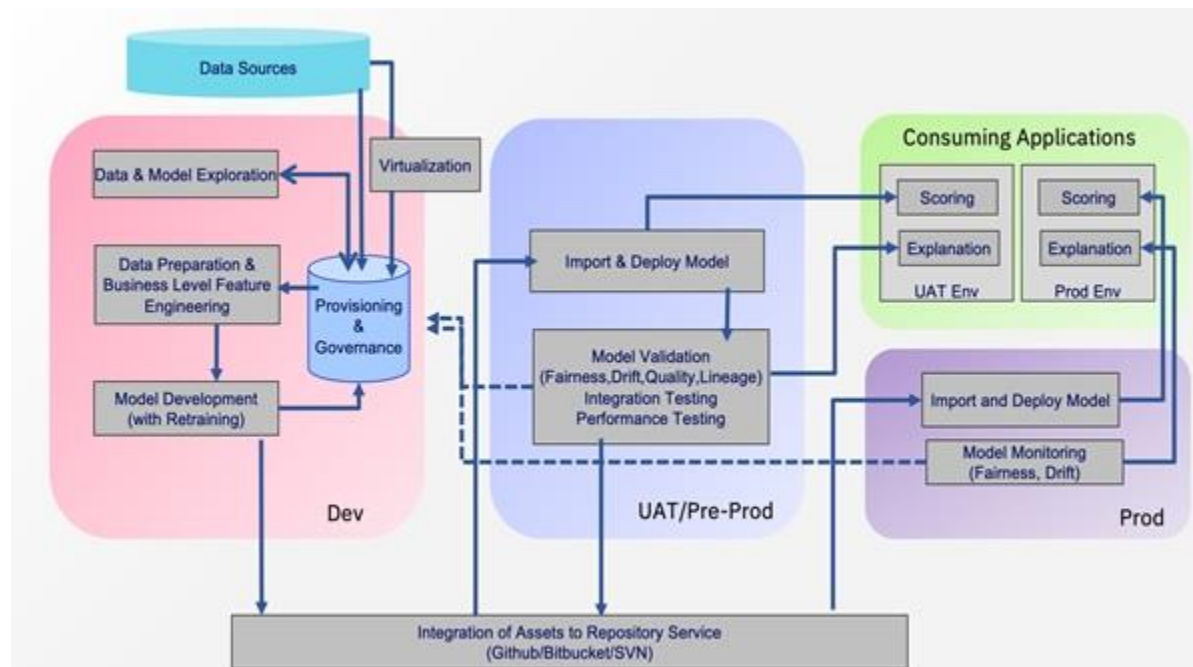
According to Forrester, “Creating an ML model is just a starting point. To bring the technology into production service, you need to solve various real-world issues such as building a data pipeline for continuous training, automated validation of the model, version control of the model, creating a scalable serving infrastructure, and ongoing operation of the ML infrastructure with monitoring and alerting.”

Various personas within the MLOps lifecycle may include Data Administrator, Data Steward, Data Engineer, Data Scientist, Business Analyst or alternative roles of users catering to solving a business case using various machine learning models.

“The global MLOps market size is projected to reach USD million by 2027, from USD million in 2020, at a CAGR of % during 2021-2027. With industry-standard accuracy in analysis and high data integrity, the report makes a brilliant attempt to unveil key opportunities available in the global MLOps market to help players in achieving a strong market position.” [1]

In a software development lifecycle, a typical workflow would involve a Development environment, UAT/Pre-prod environment, and Production environment where the final modules post rigorous stress, performance and load testing are deployed for production.

The diagram shown below indicates different environments involved within the MLOps lifecycle. Data acquisition, Data pre-processing and Model development occurs in the Development stage. This stage can involve complex and iterative feature engineering prior to building the model suitable for deployment. Within the UAT/Pre-prod environment, multiple data scientists or model validators may come together to independently validate the model with their blind data. Once the model passes the base performance threshold based on the chosen metrics, the best models are pushed into the Production environment to handle the real traffic. Such optimal models deployed can be invoked using a REST endpoint and consumed by third party applications. The scoring of models in the production environment are critical for measuring the success. There is continuous integration with common repository service for storing model and data artifacts, thereby creating a CI-CD (Continuous Integration-Continuous Deployment) pipeline.



In case the model's accuracy is reducing over time due to production data drifting from training data (data drift), the model maybe decommissioned. Typically, a couple dozen models are being used in production environment, hence if any model is not performing as per the base threshold set, the real traffic maybe gradually diverted to the other models performing better

than the rest. In this way, a continuous pipeline of models being deployed and scored can maintain consistency.

The non-performant models may get trained again on different data sets based on the data drift encountered which led to drifting in the model performance metrics. A consistent process needs to be put in place to ensure the models getting re-trained are versioned properly and stored in the repository to track model lineage in a seamless manner. This set of steps is essential for maximizing the benefits of the models.

Similarly, the data features which are being used consistently for different machine learning or deep learning use cases, may get stored in the common data management repository called “feature stores”. In case a new business case is proposed which may involve reusing some of the existing features, it can easily be fetched from feature store database and used to train the new model accelerating the time in feature engineering and pushing the models into production leading to efficient model operationalization flow. As time progresses, the MLOps market is bound to shine with increasing efforts to streamline the entire end-to-end operationalization process.

Engineering Month

Every year in March, the Canadian engineering community celebrates National Engineering Month. It is the largest celebration of engineering excellence. It is to celebrate the diversity of thought and people that make up the engineering profession, and demonstrates that there’s a place for everyone, especially women, in engineering to learn and grow together. The world of engineering keeps growing and we have to change with it. Here are some statements from IEEE Chapter Chairs and supporters.

Lian Zhao, Chair of Vehicular Technology Chapter, IEEE Toronto Section:

I am happy to celebrate the International Women’s Day, as a way to highlight Equity, Diversity, and Inclusion (EDI) for women to engage in all areas of specialization, and to recognize the achievements and contributions of Women Engineers and Women Researchers.

Mehrdad Tirandazian, Chair of Systems, Man and Cybernetics (SMC) Chapter, IEEE Toronto Section:

Engineering is a discipline dedicated to problem solving, it consists of different fields of Science and Mathematics, and helps us to clean the environment and water systems, create clean and efficient transportation systems, find new sources of energy, and find solutions to some of the world's most complex challenges too.

Sylvia Raynham, Previous WIE Treasurer, IEEE Toronto Section:

I like to thank the IEEE Toronto Section for presenting me the "Appreciation of Service Award". One has said that "women are the pillar of the society", being a member of Women in Engineering and having 2 daughters who are part of the STEM (Science, Technology, Engineering and Math) work force. I strongly recommend women and men continue to striving for the best that they can be to tackle some of the world's big issues and participate in the more demanding careers in the STEM area such as Artificial intelligence specialist, Data Scientist, Robotics.

Hadeel Elayan Mohammad, Vice Chair of Communications Chapter, IEEE Toronto Section:

Engineering is a passion that I nurtured through my continuous quest to explore all that is new and dig deep into problems until I find solutions. Studying engineering allowed me to constantly rediscover myself as I am always exposed to the most novel technologies and trends. It made me realize that truly disruptive technologies can emerge at the interface of diverse research arenas which is the key to innovative solutions. For all young women interested in a career in STEM, particularly engineering, I would say not to fear failure, but rather fear not trying. Always remember that when one door closes, somewhere a window opens. It's only through persistence that we can find who we are. Salute to all strong women, may we know them, may we be them, may we raise them.

Abdul Bhuiya, Vice Chair of PELS&CE Chapter, IEEE Toronto Section:

There are a couple of things that comes to mind when I think of engineering. I think of solving, designing, inventing, testing, creating, etc. To me, all these words are just part of what it means

to be an engineer. It allows us to dream big and mold them into reality. It is a form of art, and it is the satisfaction you get when you see your work come to realization. Sometimes we find ways to solve difficult problems with simple solutions and other times, we have problems that require us to put hours of work and thought into it. There is so much to engineering and this only hits half of what it means to be an engineer. Everything you design and create will be questioned. We study the trade-offs e.g., cost vs. performance, we study the environmental effects of our work, and we ensure our work is done correctly, safely, and thoroughly. We are held to have the highest of standards, so the public can trust the work we do and the products they use. Engineering can open so many doors and possibilities for your career growth and ambitions. I believe anyone can become an Engineer. It doesn't matter who you are, if you have the right mindset, motivation, and creativity, you can really accomplish great feats.

Shermineh Ghasemi, Secretary of Computational Intelligence, IEEE Toronto Section:

It's easy for us to get caught up in negative patterns, versus seeing what positive changes you can make. Especially for women and minorities, we need to learn to see challenges as stepping-stones instead of hurdles. They really can bring you experience and closer to your goals.

Julia Wagner, Chair IEEE University of Toronto Student Branch:

By studying engineering, I feel that my future has unlimited possibilities with the fields I can work in and the impact I can have on the world. While being an engineer can be challenging, I look forward to the rewards of doing complex work and providing an example to women interested in pursuing a career in engineering.

Younas Abbas, Vice Chair, Computer Chapter, IEEE Toronto Section:

Engineering is at its pinnacle and we are in the position to find cures for diseases, elevate the suffering from those parts of the world where hunger, poverty, lack of education and absence of basic necessities of life are ailing humanity. The world has come so far with the help of technology overcoming numerous problems which were a dream in the past centuries. The evolution of science has helped humanity to explore the galaxies, go deeper into the oceans,

finding ways to save the endangered species of our home planet earth and about finding new homes for humanity on other planets.

No matter which direction humanity would pursue, women have been playing a great role to bring us to the next level. From centuries, women like Fatima Al-Fihri who belongs to a migrant community in Fes, Morocco established the first degree-granting education institute (recognized by UNESCO and Guinness World Records) in the year 859 to Maire Curie (Marie Salomea Skłodowska Curie 1867-1934) a great physicist and chemist, Edith Clarke an electrical engineer, Grace Murray Hopper a computer scientist, Katherine Johnson, Chien-Shiung Wu, Rosalind Franklin. The list is very long. They were never a step behind to serve humanity and still playing their part. Recently in west Germany when a couple, Sahin and Tureci, founder of BioNTech breakthrough in finding the cure for COVID-19 it has proved that women are a crucial counterpart for curing humanity.

These great women and a lot more I wasn't able to mention, deserved to be recognized well. The world still needs to learn that equality in every form is necessary to be treated everywhere and humans should not be identified on the basis of their gender, race, color, or anything else but what actually they do.

Get Involved with Us!

IEEE Toronto section is looking forward to hearing from you. your contributions are welcome to this monthly newsletter. We invite our members to share and submit:

- Short Story (about IEEE members, WIE members)
- News items and Affinity group reports
- Technical Articles/Blogs (Brief discussions of cutting edge research, new technological tools, topics of your choice)

Submission

Articles should be submitted in Word format. Word count for News items, Affinity group reports is 50 to 200 words and for blogs/ articles is 500 to 800 words.

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