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Work Experience

IBM T.J. Watson : (NewYork, NY, USA)

Feb, 2022 -now

Staff Research Scientist: ITOps, Distributed Cloud

Projects and Accomplishments:

1. ITOps: challenge co-leader developing an action recommendation system using foundation models (FM) targetting multiple IBM business (Instana, RedHat, IBM Software Support System).
2. WatsonX - IBM Data Pile: key person handling the preprocessing pipeline for getting data from raw to clean state for training foundation models (FM) - first 1 trillion tokens data for IBM.
3. CyberSecurity (IBM CISO): key person developed the pipeline for Cybert lake-house and inference pipeline for threat detection using foundation models (FM) - co-developed the first version of Cybert model deployed to CISO team.
4. 2022 Outstanding accomplishment for log-lake house development for log data (key person leading to \$40M contribution to HealthPlatform in Europe)

IBM T.J. Watson : (NewYork, NY, USA)

Feb, 2020 - Jan, 2022

Research Scientist: Distributed AI & TimeSeries Group

Projects and Accomplishments:

1. Contribute to IBM-open-source projects for key IBM products (IBM Cloud-SQL/Data Engine): IBM OpenSource Committer
2. Published IBM blog: Time Series Analytics for IBM Virtual Private Cloud (VPC) Flows Using Grafana.
3. GPU works in Geohash (3000x times speedup vs. single-core CPU) in collaboration with Brazil research lab to deliver core APIs for 3D spatial-temporal functionality.
4. TimeSeries works: one of two developers of Python library for the Watson Core TimeSeries library since 2020, Time series data visualization in 2021: Grafana connector to Time-series library in IBM Data Engine (previously Cloud SQL), Innovate IBM ibmcloudsql Python library in 2020 – the only and official Python interface to IBM Data Engine
5. 2020 Research Accomplishment Award for reusable asset in Watson Health in NeuroScience
6. key person developing the Federated Learning model for CVS Aetna Healthcare pilot project

IBM T.J. Watson : (NewYork, NY, USA) Feb, 2017 - 2020
Research Staff Member: Multiscale Modeling: Heart & Brain Modeling Group
Projects and Accomplishments:

1. **Architect**: GPU-based IBM's Model Graph Simulator and IBM's Neural Tissue Simulator,
2. **IBM recognition**: IBM AI Skills Academy Technical Role

IBM T.J. Watson : (NewYork, NY, USA) Aug, 2015 - Jan-2017
Postdoctoral Researcher: Multiscale Computational Modeling Group
Project: MPI-based scalable neural tissue simulation and brain modeling for identification of Huntington's Disease neural mechanisms and treatments

Tietronix Software Inc. (Houston, TX, USA) Oct, 2014 - Aug, 2015
Principal Software Engineer (Life Science Group)
Assignment (R&D): Involved in proposal writing (SBIR, STTR), Hadoop-based system with GPU computing for biomedical research, cloud computing and data analytics for NASA's OpenData initiative.

IBM T.J. Watson : (NewYork, NY, USA) Summer 2013
Summer Intern: Functional Genomics & System Biology Group
Research Advisors: Jeremy Rice/Gustavo Stolovitzky
Wrote parallel code to generate M-cell islands in a whole-heart configuration. This is part of the Cardioid Heart Modelling Project, a massively parallel computing software that runs on IBM BlueGene/Q.

BIO-IT Foundry Center in Gwangju - Research Assistant: South Korea Mar,2006-Mar,2008
Developed protein spot matching algorithm (ProteomeBase software package)
Two-dimensional gel electrophoresis images
Artificial Neural Networks

Education

- **Ph.D., Bioinformatics & Computational Biology** 2008 - 2014
George Mason University - Krasnow Institute of Advanced Studies - Fairfax, VA
 - Advisor: Prof. M. Saleet Jafri (Chair, Dept. Molecular Neuroscience)
 - Thesis: Computational studies of Ca^{2+} -entrained arrhythmias in cardiac cells using GPGPU
- **M.Eng., Electrical and Computer Engineering** 2006-2008
Chonnam National University - Gwangju, South Korea
 - Advisor: Assoc. Prof. Yonggwon Won (Director, Artificial Neural Network Lab)
 - Thesis: The study of Image Analysis Methods for Two-dimensional Gel Electrophoresis
- **B.Eng., Computer Science** 2000-2005
HoChiMinh City University of Technology - Viet Nam

- Advisor: Dr. Quan V. Ho
- Thesis: Building a Domain-Target Crawling Tool

Skills

Big Data: Hadoop, Spark (PySpark), Cloud SQL (DataEngine), Ray.

Mathematical modeling : computational neuroscience (pyramidal neurons, striatal neurons), cardiac myocyte.

Graph computing : architecture of IBM's GPU-based Model Graph Simulator

Optimization : optimization using evolutionary algorithms: IBM's Neural Tissue Optimizer, DEAP, BluePyOpt

Machine learning : federated AI (work with Aetna/CVS), time-series analysis (released to multiple IBM products), IBM AI Skills Academy Technical Role (Deep Learning and Neural Network) with sklearn, tensorflow, pytorch; unsupervised learning with principal component analysis (PCA), independent component analysis (ICA), SVD, and clustering.

programming languages: extensive experience in multiple languages (Python, Java, TypeScript, Fortran, C/C++, IDL, R, MatLab (Octave), Shell Scripting (Bash, Fish, Unix tools))

container: Docker (Swarm), Kubernetes

high performance computing (HPC): MPI (OpenMP), GPU Nvidia CUDA

cloud computing: IBM Cloud, Ubuntu/MAAS, Google App Engine (GAE) using webapp2 Web Framework and RESTful APIs, AWS.

Operating Systems: deep understanding of Linux architecture and environment.

Editors: VS Code, Vim, Emacs, L^AT_EX, OpenOffice, MS Office Suite.

Programming Libraries: Boost, VTK, HDF, Silo (LLNL)

Visualization Toolkits: Python jupyter lab (notebook), VisIt (LANL), gnuplot, xmgrace, IDL

Debuggers: cuda-gdb, GNU gdb (cgdb)

Database/File-format: Spark SQL (parquet), SQL(MySQL), MS Excel, HDF5, Silo format

Network Admin: managed a small cluster (16-workstations) with network file system and network information system, configure Infiniband HPC with GPU.

Graduate Coursework

- Coursera: Neural Nets, Sequence models
- Molecular Cell Biology
- Advanced Neural Networks
- Advanced Data Mining
- Digital Image Processing

- Pattern Classification
- Computer Vision
- Numerical methods for Bioinformatics
- Biological Sequence Analysis
- Sequence Models and Structuring Machine Learning Projects

Training

Virtual School of Computational Science and Engineering - proven algorithmic techniques for many-core processors (CUDA)	Summer 2011
Cold Spring Harbor Laboratory - Summer course in Computational Cell Biology	Summer 2010
Virginia Commonwealth University training in Modeling the Heart in 3D	Fall 2009
VCU training in Biological and Biomedical signals	Spring 2009

Awards & Honors

IBM Research Accomplishment:	2020, 2022
IBM Research Impact Accelerator (IBM Research) https://ibm.biz/BdqRkc : Top 3 with “Graph Specification for Accelerated Neuromorphic Ecosystem (YKT)”	2019
Manager’s Choice Award (IBM)	2017
Dissertation Completion Fellowship (GMU)	Spring 2014
Honorable Mention (Oral Presentation) - Student Research Day (GMU)	Spring 2013
Academic Excellence Award (School of System Biology - GMU)	2012
NVIDIA Graduate Fellowship Finalist (Using GPU for research)	2011
Best Oral Presentation - Student Research Day (GMU)	Fall 2010
Department Fellowship in recognition of good academic performance	2010
Travel Grant to NHI-NHLBI training course, VA	2009
Travel Grant to AMIA summit on Translational Biology, CA	2009
Research Assistantship at GMU	2008-now
Graduate Commonwealth Outstanding Student Award	2008-2010
Brain Korea ’21 Scholarships, South Korea	2007-2008
Research Assistantship at Intelligent Computing@Network Lab, South Korea	2006-2008
Full Scholarship for Master’s Program, South Korea	2006-2008

Professional Membership & Other Activities

Co-Chair: IEEE Cloud conference [link]	2022
Co-Chair: Listening to the Heart and Brain: Current Challenges in Multiscale Modeling Symposium	
Frontiers in Applied and Computational Mathematics [link]	NJIT FACM17
Reviewers: ICASSP, DCASE	
Editorial Consultant - Interventional Cardiology Grand Rounds	Sep.,2015 - now
Reviewer - 3rd International Conference on Biomedical Engineering and Biotechnology (ICBEB2014)	
President of Bioinformatics Graduate Student Organization - GMU	2010-2012
Student Member of Biophysical Society (BPS)	2010-2012
Vice President of Bioinformatics Graduate Student Organization - GMU	2009-2010
Student Member of IEEE	2007-2009

Key Patents/Technical Reports

1. (2023) A method to compress and analytically query large scale logs
2. (2023) System and Method for Optimal Fault Injection Mechanism for Building Significant Signatures
3. (2022) Hierarchical Data Skipping Using Data Sketches (P202103171)
4. (2021) Annotation of a Machine Learning Pipeline with Operational Semantics
5. (2020) Illustrative AI for Determining the Interaction Between Drugs and the Brain using a Brain Measures and a Brain Model
6. (2020) Systems and methods to facilitate determination of interaction between medications and the brain using a brain measure and a brain model
7. (2019) Illustrative medical imaging for functional prognosis estimation
8. (2015) Tuan M. Hoang-Trong, George Blair Williams, M. Saleet Jafri, “*Methods and Systems for Utilizing Markov-chain Monte-carlo simulations*” (US 9,009,095)

Publications (book chapters)

1. Tuan M. Hoang-Trong et al. *A Privacy-preserving Product Recommender System* - Springer book on Federated Learning
2. Thach Nguyen, Timothy Yee, Tuan M. Hoang-Trong, Loan Pham, & John Reilly, “*Futuristic Applications to Today’s management of Cardiovascular Problems*” - Evidence-Based Cardiology Practice: A 21st century approach (2009)
3. Thach Nguyen, Tuan M. Hoang-Trong, Timothy Yee, Cindy Grines, Dayi Hu, & John Reilly, “*Practicing Cardiology of the 21st Century*” - Evidence-Based Cardiology Practice: A 21st century approach (2009)

Publications (journals)

1. A Ullah, MT Hoang-Trong, WJ Lederer, RL Winslow, MS Jafri. *Critical Requirements for the Initiation of a Cardiac Arrhythmia in Rat Ventricle: How Many Myocytes?* (Cells, 2022)
2. Tuan M. Hoang-Trong et al. *A Stochastic Spatiotemporal Model of Rat Ventricular Myocyte Calcium Dynamics Demonstrated Necessary Features for Calcium Wave Propagation* (Membranes, 2022)
3. SL Allam, TH Rumbell, T Hoang-Trong, J Parikh, JR Kozloski *Neuronal population models reveal specific linear conductance controllers sufficient to rescue preclinical disease phenotypes* (IScience, 2021)
4. Tuan M. Hoang-Trong et al. *Cardiac alternans occurs through the synergy of voltage-and calcium-dependent mechanisms* (Membranes, 2021)

5. Oceau et al. "Transient, Consequential Increases in Extracellular Potassium Ions Accompany Channelrhodopsin2 Excitation" (Cell Report, 2019) [link]
6. Tuan M. Hoang-Trong, Sarah E. Motley, John Wagner, Robert R. Kerr and James Kozloski. "Explicit multi-compartment models of dendritic spines in the Neural Tissue Simulator modify action potential back-propagation" (2017) (IBM Journal of Research & Development, vol.61, issue 2/3). [link]
7. Tuan M. Hoang-Trong, A. Ullah, and M. S. Jafri. "Calcium Sparks in the Heart: Dynamics and Regulation" (2015) (Research and Reports in Biology, (6)). [link]
8. Niall Macquaide, Tuan M. Hoang-Trong, Jun-ichi Hotta, Wouter Sempels, Ilse Lenaerts, Patricia Holemans, Johan Hofkens, M. Saleet Jafri, Rik Willems, Karin R. Sipido. "Ryanodine Receptor cluster fragmentation and redistribution in persistent atrial fibrillation enhance calcium release" (2015) (Cardiovascular Res., 108 (3), 387-398). [link]
9. Limbu S, T. M. Hoang-Trong, B. L. Prosser, W. J. Lederer, and M. S. Jafri. "Modeling Local X-ROS and Calcium Signaling in Heart" (2015). Biophys. J. (109 (10), 2037-2050).
10. Eva Wagner, Marcel Lauterbach, Tobias Kohl, George S. B. Williams, Julia H. Steinbrecher, Jan-Hendrik Streich, Brigitte Korff, Hoang-Trong M. Tuan, Brian Hagen, Stefan Luther, Gerd Hasenfuss, Volker Westphal, Ulrich Parlitz, M. Saleet Jafri, Stefan W. Hell, W. Jonathan Lederer, Stephan E. Lehnart: "STED live cell imaging shows early remodeling of T-tubule nanowires following myocardial infarction in mice" (Circ. Res., 2012)[link]
11. George Blair Williams, Aristide C. Chikando, Tuan M. Hoang-Trong, Eric A. Sobie, W.J. Lederer, M.Saleet Jafri, "Dynamics of Calcium sparks and Calcium leaks in the heart" (Biophysical J., Vol.101, 1287-1296)
12. Hieu T.Huynh & Minh-Tuan T.Hoang & Nguyen H.Vo & Won Y. "An Improvement of Outlier Detection in Linear Regression based on Area-Descent", WSEAS Transactions on Computers Research (Issue 2, Vol. 1, December 2006), pg. 174-180.
13. Nguyen H.Vo & Hieu T.Huynh & Minh-Tuan T.Hoang & Kim J.J & Won Y. "Extension of General Mapping Convergence Framework using Extreme Learning Machine in Single Class Classification", WSEAS Transactions on Computers Research (Issue 2, Vol. 1, December 2006), pg.102-107.

Publications (conferences)

1. Tadanobu Inoue, Phongtharin Vinayavekhin, Shu Morikuni, Shiqiang Wang, Tuan Hoang Trong, David Wood, Michiaki Tatsubori, Ryuki Tachibana, "Detection of Anomalous Sounds for Machine Condition Monitoring Using Classification Confidence, DCASE 2020.
2. Tuan M. Hoang-Trong, George S.B. Williams, Aristide C. Chikando, Eric A. Sobie, W.J. Lederer, M. Saleet Jafri, "Stochastic Simulation of Cardiac Calcium Dynamics and Waves" (33rd IEEE-EMBC Conference, Boston, Aug. 2011) [link]
3. Tuan M. Hoang-Trong, George S.B Williams, Gregory D. Smith, Saleet Jafri, "Using GPU in studying cellular molecular events of cardiac arrhythmias" (GPU Technology Conference'10, Sept. 21-24, San Jose, CA, USA)
4. Minh-Tuan T.Hoang & Yonggwon Won, "A Marker-free Watershed Approach for 2DGE Protein Spot Segmentations", International Symposium on Information Technology Convergence, Proceeding IEEE CS (ISITC'07, Nov. 23-24, Jeonju, Korea) (Acceptance rate: 29.7%) [link]

5. Hieu T. Huynh, Nguyen H. Vo, Minh-Tuan T. Hoang & Yonggwan Won, “*Outlier Treatment for SLFNs in Classification*”, 5th International Conference on Computational Science and Its Applications, Proceeding IEEE Computer Society (ICCSA’2007, Aug. 26-29, Kuala Lumpur, Malaysia), pg. 104-109 (Acceptance rate: 15%)
6. Minh-Tuan, T.Hoang & Won, Y. & Yang, H. “*Cognitive States Detection in fMRI using incremental PCA*”, The 5th International Conference on Computational Science and Its Applications, Proceeding IEEE Computer Society (ICCSA’2007, Aug. 26-29, Kuala Lumpur, Malaysia), pg.335-341 (Acceptance rate: 15%) [link]
7. Hieu, T.H. & Nguyen, H.V., Minh-Tuan, T. Hoang & Won, Y. “*Performance Enhancement of RBF Networks in Classification by Reducing Effect of Outliers in the Training Phase*”, Modelling Decisions for Artificial Intelligence (MDAI’2007, Aug. 16-18, Kitakyushu, Japan), LNAI, Springer-Verlag, pg.341-350.
8. Minh-Tuan, T.Hoang & Hieu, T.H & Nguyen, H.V & Won, Y. “*A Robust Online Sequential Extreme Learning Machines*”, Proceeding of the 4th Int. Symp. on Neural Networks (ISNN’2007, June 3-07, Nanjing, China), LNCS 4491, Springer-Verlag, pg.1077-1086 (Accept rate: 20.3%) [link].
9. Minh-Tuan, T.Hoang & Hieu, T.H & Nguyen, H.V & Kim, J.J & Won, Y. “*Two-step Iterative Registration for 2D-Gel Electrophoresis Images*”, Proceeding of the 5th IEEE Int. Conf. on Research, Innovation, and Vision for the Future (RIVF’2007, March 07-09, Ha Noi, Viet Nam), pg.274-280 (Acceptance rate: 29%)[link]
10. Hieu, T.H & Minh-Tuan, T.Hoang & Nguyen, H.V & Kim, J.J & Won, Y. “*Outlier Detection with Two-Stage Area-Descent Method for Linear Regression*”, Proceeding of the 6th WSEAS Int. Conf. on Applied Computer Science (ACS’06, December 16- 18, Tenerife, Spain)[link]
11. Nguyen, H.V & Minh-Tuan, T.Hoang & Hieu, T.H & Kim, J.J & Won, Y. “*Iterative Extreme Learning Machine for Single Class Classifier using General Mapping Convergence framework*”, Proceeding of the 6th WSEAS Int. Conf. on Applied Computer Science (ACS’06, December 16-18, Tenerife, Spain)
12. Quan, H. V. & Dung, N.V. & Minh-Tuan, T.Hoang, “*A Domain - Specific Crawling Tool for the Internet*”, Proceeding of the 2005 International School on Computational Sciences and Engineering: Theory and Applications (COSCI’2005, March 2-4, Ho Chi Minh City, Viet Nam).

Abstract/Poster

1. Tuan M. Hoang-Trong, M. Saleet Jafri, W.J. Lederer, “*Cardiac alternans occurs through the synergy of Voltage- and Calcium-dependent mechanisms* (Biophysical Society Meeting 2015)
2. Sarita Limbu, Tuan M. Hoang-Trong, W.J. Lederer, M. Saleet Jafri, “*Mechanism of Stretch-Activated Reactive Oxygen Modulation of Excitation-Contraction Coupling: Computational Studies*” (Biophysical Society Meeting 2015)
3. Aman Ullah, Tuan M. Hoang-Trong, George S.B. Williams, W.J. Lederer, M. Saleet Jafri, “*Spontaneous Calcium Release Can Initiate a Calcium-Entrained Arrhythmia*” (Biophysical Society Meeting 2014)
4. E. Wagner, T. Kohl, H.T.M. Tuan, V. Westphal, U. Parlitz, S. Luther, S.W. Hell, M.S. Jafri, W.J. Lederer, S.E. Lehnart “*Superresolution analysis identifies proliferative changes of excitable*

membranes (T-tubules) during cardiac remodeling leading to orphaning of Ca²⁺ release sites and prolonged action potentials [BEST BASIC SCIENCE ABSTRACT '2013]
http://europace.oxfordjournals.org/content/15/suppl_2/ii223.full

5. Tuan M. Hoang-Trong, George S. Williams, Stephan E. Lehnart, W. Jonathan Lederer, M. Saleet Jafri, “*Stochastic Simulation Assessing the Functional Changes Occurring during Heart Failure*,” BPS'12
6. Tuan M. Hoang-Trong, George S. Williams, M. Saleet Jafri, “*GPU-enabled 3D temporospatial whole-cell model of ventricular myocyte in studying calcium- entrained arrhythmias*” (GTC'12)
7. Tuan M. Hoang-Trong, George S.B. Williams, W.J. Lederer, M. Saleet Jafri, “*GPU-enabled stochastic spatiotemporal model of rat ventricular myocyte calcium dynamics*” (Biophysical Society Meeting 2011 - BPS'11)
8. Tuan M. Hoang-Trong, George S. Williams, Gregory D. Smith, M. Saleet Jafri, “*Unveiling cellular and molecular events of cardiac arrhythmias using CUDA-capable GPU*” (GPU Technology Conference 2010 - GTC'10)

* = equal contribution