# Hung Cao

*Postdoc Fellow - Data Scientist*

*People in Motion Lab (Cisco Big Data Analytics)*
*University of New Brunswick*
*Room E-50, Head Hall, 15 Dineen Drive, Fredericton, Canada*
*+1 (506) 230 2949*
*www.hungcao.me*
*hcao3@unb.ca*

## Education

May 2016 – Nov 2019 **PhD in Geomatics Engineering (specialize in Data Science)**, *University of New Brunswick*, Fredericton, Canada, *GPA: 4.1/4.3*.

- *Dissertation:* Developing an Analytics Everywhere Framework for the IoT in Smart City Applications
- *Supervisor:* Dr. Monica Wachowicz and Dr. Chiara Renso
- *Emphasis:* Big Data Analytics, Internet of Things, Edge Computing, Fog Computing, Cloud Computing
- *Relevant Course:* Intro to Big Data and Data Science, Machine Learning and Data Mining
- Doctoral Scholarship co-funded by NSERC, Cisco, and UNB

Sep 2017 – Jan 2018 **Diploma in University Teaching**, *University of New Brunswick*, Fredericton, Canada.

Sep 2014 – Oct 2015 **MSc in Computer Science**, *University College Dublin*, Dublin, Ireland, *GPA: 3.83/4.2*.

- *Thesis:* A new approach to process massive LiDAR data on the cloud computing environment
- *Supervisor:* Dr. NhienAn LeKhac
- *Emphasis:* Machine Learning, Cloud Computing
- *Relevant Course:* Virtualisation and Cloud Computing, Machine Learning, Distributed Systems
- 1st Class Honours

Oct 2006 – May 2011 **BEng in Computer Engineering**, *University of Information Technology, VNU-HCM*, Ho Chi Minh City, Vietnam, *GPA: 7.51/10*.

- Thesis: Comparative study on controlling approaches and an experimental model for musical fountain (Score: 9.4/10)
- Supervisor: Dr. Vu Duc-Lung
- *Emphasis:* Control Systems
- *Relevant Course:* Object-Oriented Programming, Data Structures, Computer Architecture
- Scholarship for outstanding students

## Selected Honors, Grants, and Awards

- **School of Graduate Studies Travel Award 2019** – University of New Brunswick.
- **Best Minimum Viable Products Award 2019** – Fred E-hack Smart City Hackathon organized by The City of Fredericton and eleven-x
- **MITACS Accelerate Fellowship 2019** – in partnership with Rimot Inc., Acadia University, and Dalhousie University
- **Eugene E. Derenyi Graduate Academic Achievement Award 2018** – UNB
- **School of Graduate Studies Travel Award 2017** – University of New Brunswick
- **Graduate Research Assistantship 2016-2020** – University of New Brunswick
- **Graduate Academic Assistantship 2016-2020** – Cisco/NSERC IRC
- **International graduate differential fee scholarship 2016-2020** – UNB
- **UCD Research Scholarship 2014-2015** – University College Dublin
- **Irish Aid IDEAS Scholarship 2014-2015 (Strand II - Technical Area)** – Department of Foreign Affairs and Trade - Government of Ireland (Full scholarship to study for a MSc in Computer Science at UCD)
- **Annual scholarships for outstanding students 2006-2011** – UIT
- **Scholarship for excellent students 2007** – SKT-SSU IT Training Center (Vietnam), sponsored by SK Telecom and Soongsil University (Korea)

## Publications

### PhD Dissertation

1. **Cao, H.** (2020). Developing an Analytics Everywhere Framework for the Internet of Things in Smart City Applications. *University of New Brunswick*.

### Journals

1. **Cao, H.**, & Wachowicz, M. (2020). A Holistic Overview of Anticipatory Learning for the Internet of Moving Things: Research Challenges and Opportunities. Special Issue State-of-the-Art in Spatial

Information Science. In *International Journal of Geo-Information*, 9(4), 272. (**Peer Reviewed** - Impact Factor: 1.840)
2. **Cao, H.**, & Wachowicz, M. (2020). From IoT to Analytics Everywhere: Enabling Technologies, Grand Challenges, Opportunities, and Applications for Smart City. In *IEEE Communications Magazine*. (**Under submission**)
3. **Cao, H.**, & Wachowicz, M. (2019). An Edge-Fog-Cloud Architecture of Streaming Analytics for Internet of Things Applications. Special Issue Edge/Fog/Cloud Computing in the Internet of Things. In *Sensors*, 19(16), 3594. (**Peer Reviewed** - Impact Factor: 3.031)
4. **Cao, H.**, Wachowicz, M., Renso, C., & Carlini, E. (2019). Analytics Everywhere: generating insights from the Internet of Things. In *IEEE Access*, 7, 71749-71769. (**Peer Reviewed** - Impact Factor: 4.098)
5. **Cao, H.**, & Wachowicz, M. (2019). The design of an IoT-GIS platform for performing automated analytical tasks. In *Computers, Environment and Urban Systems*, 74, 23-40. (**Peer Reviewed** - Impact Factor: 3.393)

### Conferences, Presentations, and Abstracts

1. **Cao, H.**, & Wachowicz, M. (2019). Analytics Everywhere for streaming IoT data. In *2019 Sixth International Conference on Internet of Things: Systems, Management and Security*. IEEE. Granada, Spain. (**Peer Reviewed**)
2. **Cao, H.**, Brown M., Chen L., Smith R., & Wachowicz, M. (2019). Lessons learned from integrating batch and stream processing using IoT data. In *2019 Sixth International Conference on Internet of Things: Systems, Management and Security*. IEEE. Granada, Spain. (**Peer Reviewed**)
3. Parise A., Callejo, M. A. M., **Cao, H.**, Mendonca M., Kohli H., & Wachowicz, M. (2019). Indoor Occupancy Prediction using an IoT Platform. In *2019 Sixth International Conference on Internet of Things: Systems, Management and Security*. IEEE. Granada, Spain. (**Peer Reviewed**)
4. **Cao, H.**, Wachowicz, M., Renso, C., & Carlini, E. (2018). An edge-fog-cloud platform for anticipatory learning process designed for internet of mobile things. In *arXiv: 1711.09745*.
5. **Cao, H.**, Wachowicz, M., & Cha, S. (2017, December). Developing an edge computing platform for real-time descriptive analytics. In *Big Data (Big Data), 2017 IEEE International Conference on (pp. 4546-4554)*. IEEE. Boston, MA, USA. (**Peer Reviewed**)
6. Maduako, I., **Cao, H.**, Hernandez, L., & Wachowicz, M. (2017, October). Combining edge and cloud computing for mobility analytics. In *Proceedings of the Second ACM/IEEE Symposium on Edge Computing (p. 22)*. ACM. San Jose, CA, USA. (**Peer Reviewed**)
7. Hernandez, L., **Cao, H.**, & Wachowicz, M. (2017, October). Implementing an Edge-Fog-Cloud architecture for stream data management. In *Fog World Congress (FWC), 2017 IEEE (pp. 1-6)*. IEEE. Santa Clara, CA, USA. (**Peer Reviewed**)
8. **Cao, H.**, & Wachowicz, M. (2017, August). The design of a streaming analytical workflow for processing massive transit feeds. In *2nd International Symposium on Spatiotemporal Computing*. Harvard University, Cambridge, MA, USA. (**Peer Reviewed**)
9. **Cao, H.** (2017). What is the next innovation after the internet of things?. In *arXiv:1708.07160*.
10. Cha, S., Ruiz, M. P., Wachowicz, M., Tran, L. H., **Cao, H.**, & Maduako, I. (2016, December). The role of an IoT platform in the design of real-time recommender systems. In *Internet of Things (WF-IoT), 2016 IEEE 3rd World Forum on (pp. 448-453)*. IEEE. Reston, Virginia, USA. (**Peer Reviewed**)
11. **Cao, H.**, Maduako, I., Cavalheri, E., Brideau, E., & Wachowicz, M. (2016, September). The Role of Graph Databases in Geomatics. In *Geomatics Atlantics 2016*. Fredericton, NB, Canada.
12. **Cao, H.**, Maduako, I., Cavalheri, E., Brideau, E., & Wachowicz, M. (2016, September). How can graph databases improve transit systems? In *UNB Research Showcase*. University of New Brunswick, Fredericton, NB, Canada.
13. **V-H. Cao**, K-X. Chu, N-A. Le-Khac, M-T. Kechadi, D. Laefer, L. Truong-Hong. Toward a new approach for massive LiDAR data processing, IEEE International Conference on Spatial Data Mining and Geographical Knowledge Services, July 08-10, 2015, Fuzhou, China.
14. Lung Vu Duc, **Hung Cao Van**, Quoc Nguyen Viet, Loc Nguyen Phuoc. Analysis of Vietnamese Tones to optimize database in speech synthesis using unit selection method, IEEE International Symposium on Signal Processing and Information Technology, December 12-15, 2012 - Ho Chi Minh City - Vietnam (ISBN 978-1-4673-5604-6)
15. **Hung Cao**, La Le, Duy Phan, Lung Vu. Musical fountain modeling, controlled by audio frequency analysis using FFT algorithm, National Conference on Information Technology, CanTho, Vietnam, 2011 (in Vietnamese)

## Research Experience

Feb 2020 – Present **Postdoc Fellow - Data Scientist**, *University of New Brunswick*.

May 2016 – Nov 2019 **PhD Candidate**, *University of New Brunswick*.
- *Project:* Big data analytics for the Internet of Things data streams (Funded by Cisco)
  - Designed an Analytics Everywhere framework and built the Edge-Fog-Cloud architecture
  - Implemented novel analytical methodologies (descriptive, diagnostic, & predictive analytics) for IoT data
- *Project:* Smart parking in Saint John City collaborating with HotSpot Company (Funded by NSERC/Cisco)
  - Developed a parking prediction system based on Random Forest ML model using GIS & parking data
- *Project:* Big data analytics to improve transit system in Moncton City collaborating with Codiac Transit and The Black Arcs (Funded by NSERC Engage)
  - Built a graph database using Neo4j and analyzed realtime transit data for improving transit service
  - Performed descriptive statistics, clustering, predictive algorithm to anticipate trip schedule, behaviors
- *Project:* Investigations and Analysis of Industrial IoT Ecosystems in partnership with Rimot Inc., Acadia University, and Dalhousie University (Funded by MITACS)
  - Identified abnormalities from RF sensors data to support early warning system

Oct 2014 – Nov 2015 **Research Associate**, *University College Dublin*.
- *Project:* High performance computing for massive LiDAR Data processing
  - Experimented, evaluated, and built kd-tree, Octree, k Nearest Neighbor algorithms in Python
  - Adapted Hadoop MapReduce to compute LiDAR data in parallel fashion, performed big LiDAR data analysis on the Cloud Computing environment and developed visualization software

Jun 2011 – Aug 2014 **Researcher**, *University of Information Technology, VNU-HCM*.
- *Project:* Analysis and Synthesis Vietnamese Speech (Funded by UIT) - Senior member of Vietnamese Speech Processing Group
- *Project:* Hand-pose sign language recognition system for hearing-disable people (Funded by UIT)
- *Project:* Implementing a musical fountain controlling system based on the frequency analysis using FFT algorithm (Funded by VNU-HCM)

## Teaching and Mentoring

Winter 2017 **Co-supervisor**, *University of New Brunswick*, Design Project, Number of Students: 3.

Spring 2016 **Lecturer**, *University of Information Technology, VNU-HCM*, Course Title: Operating System, Number of Students: 99.

Spring 2013 **Teaching Assistant**, *University of Information Technology, VNU-HCM*, Course Title: Mobile Device Programming, Number of Students: 100.

Fall 2012 **Lab Instructor**, *University of Information Technology, VNU-HCM*, Course Title: Fundamentals of Embedded Programming, Number of Students: 50.

Spring 2012 **Lab Instructor**, *University of Information Technology, VNU-HCM*, Course Title: Verilog and VHDL Programming, Number of Students: 50.

Fall 2011 **Teaching Assistant**, *University of Information Technology, VNU-HCM*, Course Title: Computer Architecture, Number of Students: 100.

## Related Industry Experience

May 2019 – Present **Data Scientist**, *Rimot.io Inc.*
- Developed the analytics algorithm/methodology using Edge Computing to analyse IoT data streams from the Industrial Internet of Things Ecosystems

Dec 2017 – Present **Cloud Administrator**, *People in Motion Lab*.
- Managed and operated the cloud infrastructure systems provided by Compute Canada
- Installed, configured and allocated virtual cloud instances to other members in the lab
- Supported cloud servers including security configurations, patching, and troubleshooting

Oct 2010 – Mar 2011 **Embedded System Developer**, *CanhViet Co, Ltd*.
- Interned as an embedded system developer
- Built smart, embedded systems and automatically musical fountain controlling system

Jan 2008 – Jan 2009 **Senior Member**, *CERobo Team of UIT*.
- Participated Vietnam Robot Contest (ROBOCON 2008) as a senior team member representing for University of Information Technology
- Instructed and trained young students to participate in this competition a year later

Nov 2006 – Dec 2007 **Software Developer**, *Self-Employed*.

## Selected Qualifications

Jan 11th 2019 *BigDat 2019 - The 5th International Winter School on Big Data, University of Cambridge*

Nov 12th 2017 *Certificate of Completion - Deep Learning Fundamentals, Cognitive Class*

Jan 7th 2017 *Certificate of Completion - Data Science Methodology, Big Data University*

May 30th 2016 *Certificate - Neo4j Certification, Neo4j Certified Professional*

| | |
|---|---|
| May 19th 2016 | *Certificate of Completion - Introduction to R, DataCamp* |
| Nov 18th 2015 | *Certificate of Achievement - Introduction to Data Analysis using R, Big Data University* |
| Nov 3rd 2015 | *Certificate of Achievement - Introduction to NoSQL and DBaaS, IBM - Big Data University* |
| Oct 28th 2015 | *Certificate of Achievement - Spark Fundamentals II, IBM - Big Data University* |
| Jul 30th 2015 | *Certificate of Achievement - Introduction to Solr, IBM - Big Data University* |
| Jun 1st 2015 | *Certificate of Achievement - Big Data Fundamentals, Big Data University* |
| May 23th 2015 | *Certificate of Achievement - Introduction to MapReduce Programming, IBM - Big Data University* |
| May 19th 2015 | *Certificate of Achievement - Hadoop and the Amazon Cloud I, Big Data University* |
| May 19th 2015 | *Certificate of Achievement - Hadoop and Fundamentals I, IBM - Big Data University* |
| Apr 6th 2011 | *Certificate of Participation on Nokia Technology Workshop, Vietnam* |
| Oct 16th 2009 | *Certificate for completing the Training Program on Model Training Program on IT Fundamental Engineer Exam Preparation which was held by Japan External Trade Organization (JETRO) and Vietnam Training and Examination Center (VITEC) under the support of the Ministry of Science and Technology of Vietnam - Sep 14th - Oct 16th 2009, Ho Chi Minh City, Vietnam* |

## Technical Skills & Soft Skills

| | |
|---|---|
| Languages | Python, Scala, R, Java, C/C++, C#, Java Scripts, HTML, PHP, .NET, XAML |
| Other Languages | Linux shell scripts, Assembly, VHDL, Verilog, Embedded C |
| Database | SQL, MySQL, PostgreSQL, NoSQL (Neo4j, MongoDB, RethinkDB, Druid, HBase), DBaaS |
| OS | Linux, Windows Server, Windows, Windows Phone, Symbian, Android, Mac OS, iOS |
| IDE | Netbeans, Eclipse, Microsoft Visual Studio, SQL Server, Management Studio, SVN |
| Technologies & Tools | GitHub, Hadoop, Spark, Storm, Flink, YARN, MapReduce, Samza, Kafka, MXNet, Keras, Docker, XGBoost, LightGBM, Tensorflow, scikit-learn, NLTK, MLFlow, Pytorch, scikit-multiflow, Prophet, Cisco Kinetic, Superset, Grafana, RabbitMQ, Maven, ZooKeeper, Ambari, Wazuh, Zeppelin, Hive, MapR, ArcGIS, QGIS, Tableau, Power BI, Latex |
| Soft Skills | Strong communication skills; Outstanding teamwork skills; Excellent critical thinking; Great attitude and self-motivator; Quickly recognize and solve problems; Adaptable and learn new technologies quickly; Strong and resilient to work under high pressure; Independent thinker with innovative ideas |

## Professional Service

| | |
|---|---|
| Organizing member | Hackathon on Geospatial Intelligence in the National Capital Region 2018 - Ottawa, Canada |
| Membership | *IEEE Communities*: Cloud Computing; Big Data; Internet of Things; Smart Cities; Transportation Electrification; Software Defined Networks. |
| Reviewer | International Journal of Parallel, Emergent and Distributed Systems; Big Data and Cognitive Computing Journal; Future Internet Journal; Data in Science Journal; International Journal of Big Data Intelligence; MDPI Applied Sciences |

## Languages

| | |
|---|---|
| Vietnamese | **Native** |
| English | **Professional working proficiency** |

## References

Available upon request.