Mohamed Hemdan

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Education

Aug 2023 - Present	**University of Minnesota**, *Twin-Cities*, MN, USA　　　*Expected to graduate: Jun 2028* Ph.D. in Computer Science
Jan 2023	**The American University in Cairo (AUC)**, *Cairo*, Egypt B.Sc. *summa cum laude* (Highest Honors) – GPA: 3.94/4.00 Major in Computer Engineering with a Minor in Mathematics

Industrial Experience

Feb – Jul 2023 — **Microsoft**, *Cairo*, Egypt
Applied Science Intern, Notifications team, WebXT
- Analyzed users' interactions, and features to determine high importance factors in user engagement with news and notifications.

Jun – Aug 2022 — **European Council for Nuclear Research (CERN)**, *Geneva*, Switzerland
Openlab Summer Student, Openlab, IT Department
Mentors: Mr. José C. Holgueras, Dr. Sofia Vallecorsa
Topic: Federated Learning in High-Energy Physics
- Distributed GAN model training for calorimeter simulations across CERN servers and the LHC computing grid, adapting the models to federated learning for large-scale data access

Jul – Aug 2021 — **envelope.network**, *Boston, MA*, US (*Remote*)
Data Science Intern
- Developed a browser extension to extract interest from browsing history and match it with ads

Research Experience

Aug 2023 – Present — **University of Minnesota**, *MN*, USA
Research Assistant, Data Managment Lab
Supervisors: Prof. Mohamed Mokbel
Topic: Spatial Data Management
- Developed a system to evaluate whether to match points to existing roads or use them to infer new roads due to map and GPS inaccuracies. Implemented a C++ based custom spatial join. Targeting submission to VLDB
- Developing a system parallel to OSM to manage map metadata like traffic information, road attributes (e.g., number of lanes and turn restrictions). Extracted Map Metadata from GPS trajectories.

Feb – May 2022 — **The American University in Cairo**, *Cairo*, Egypt
Independent Study Research (Computer Graphics and 3D Computer Vision), CSCE Department
Supervisors: Prof. Mohamed Mostafa
Topic: Improving 3D Reconstruction Techniques
- Studied computer graphics and conducted a literature survey on various 3D reconstruction techniques. Experimented with encoder-decoder architectures, including the $Pix2Vox$ model, for multi-view shape prediction, improving Intersection over Union (IoU) accuracy.

Sep 2021 – May 2022 — **The American University in Cairo**, *Cairo*, Egypt, (**Undergraduate Thesis**)
Undergraduate Researcher, CSCE Department
Supervisors: Prof. Hamada Rizk, Prof. Hossam Sharara, Prof. Moustafa Youssef
Topic: Improving the adaptability of Indoor localization systems
- Introduced the *virtual building* concept to deep learning-based indoor localization systems, making them adaptable to changes in WiFi access points (e.g., signal instability, replacements, and position adjustments), while maintaining comparable accuracy to previous systems

Jun – Aug 2021	**Alexandria University**, *Alexandria*, Egypt *Summer Researcher Intern*, Wireless Research Center (WRC) **Supervisors**: Eng. Ahmed Shokry, Prof. Moustafa Youssef **Topic**: Improving data augmentation techniques for WiFi localization systems ○ Introduced a new data augmentation technique for outdoor localization systems using conditional GANs. Improved the accuracy by 22.2%.

Grants

Aug 2023	Three-year Ph.D. Fellowship, *College of Science and Engineering*, UMN
Aug 2023	Greiling Fellowship, *Department of Computer Science and Engineering*, UMN
2021 - 2022	Undergrad Grants UG#220911664, UG#22047986, UG#21091221 *AUC* – $9,000
2017-2022	Public School Scholarship Fund (PSSF) – Full-tuition undergraduate scholarship, *AUC*

Awards & Certificates

May 2023	KAUST Ph.D. Fellowship, *KAUST* (declined)
Mar 2023	Excellence in Undergraduate Research Award, *Academy of Liberal Arts*, *AUC*
Feb 2023	Dr. Sherif El-Kassas Award, *AUC*
Feb 2023	Dr. Abdel Rahman El Sawy Endowed Award, *AUC*
2017-2022	Dean's List for outstanding academic achievement, *AUC*
2021-2022	Micro Masters in Statistics and Data Science, *MITx* (link)
May 2022	Honors Student, *School of Sciences and Engineering*, *AUC*
Nov 2021	2nd runner-up (bronze medal), *Student Research Competition (SRC)*, *ACM SIGSPATIAL*
Nov 2018	Outstanding Scholarship Student Award for Year 2017-2018, *AUC*

Publications

1. (accepted)(tutorial) **Large Language Models for Spatial Analysis Queries,** Y. Hussein, M. Hemdan, M. Mokbel. (2025). VLDB

2. (tutorial) **Large Language Models for Urban Mobility,** Y. Hussein, M. Hemdan, M. Mokbel. (2025). IEEE MDM

3. (accepted) **Federated Learning Strategies of Generative Adversarial Networks for High Energy Physics Calorimeter Simulation,** M. Hemdan, J. Holgueras, S. Vallecorsa. (2024). Journal of Physics: Conference Series (link)

4. **Indoor Localization System for Seamless Tracking Across Buildings and Network Configurations,** H. Rizk, A. Sakr, A. Ghazal, M. Hemdan, O. Shaheen, H. Sharara, H. Yamaguchi, M. Youssef. (2023). IEEE GLOBECOM. (link)

5. (poster) **Federated Learning Strategies of Generative Adversarial Networks for High Energy Physics Calorimeter Simulation,** M. Hemdan, J. Holgueras, S. Vallecorsa. (2022). ACAT, Bari, Italy (link)

6. (poster) **Data Augmentation using GANs for Deep Learning-based Localization Systems,** J. Boulis, M. Hemdan, A. Shokry, and M. Youssef. (2021). ACM SIGSPATIAL. (link)

Skills & Technical Experience

Programming Languages: Python, C++, C, Java, Javascript

Big Data: Map-Reduce using Apache Spark, data mining algorithms (frequent items, ...)

Geospatial: Spatial Join, Geo-pandas, folium, KeplerGL, OSM parsing

Database Systems: Advanced querying and geospatial processing with PostGIS, PostgreSQL, and NoSQL databases like MongoDB

Machine Learning: Deep learning architectures with experience in GANs (tuning, distributed training) and CNNs, VAEs using (TensorFlow, PyTorch, Keras, Scikit-learn)

Others: operating systems, linux shell, Containerization and orchestration (Docker, Ansible), version control (Git), Shell scripting, ray