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Mohamed Hemdan

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
- Proposed and developed a system to enhance GPS point accuracy in navigation by evaluating whether to match points to existing roads or use them to infer new roads due to map inaccuracies. The system overcomes limitations in current map-matching and map-inference techniques by addressing potential errors in both GPS data and map information. Targeting submission to VLDB

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 2^{nd} runner-up (bronze medal), *Student Research Competition (SRC), ACM SIGSPATIAL*

Nov 2018 Outstanding Scholarship Student Award for Year 2017-2018, *AUC*

Publications

1 (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)

2 **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)

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

4 **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

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

Data Mining: Scalable big data processing using Map-Reduce and Spark

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

Data Analysis: Expertise in Social Network Analysis (SNA) and graph analysis (networkx)

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

Others: Containerization and orchestration (Docker, Ansible), version control (Git), Shell scripting