Walid A. Hanafy

PhD Candidate

Manning College of Information and Computer Sciences
University of Massachusetts Amherst
✆ *(+1) 413 345-9453*
✉ *whanafy@cs.umass.edu*
🏠*WebPage* ⧉ *washraf* in *whanafy*

Summary

I am a 5th-year PhD student at UMass Amherst with extensive experience developing large-scale and sustainable distributed systems. My recent research has focused on reducing cloud computing systems' carbon footprint and designing resource-efficient machine learning systems for the edge.

My work has been published in top-tier conferences, e.g., *ASPLOS, INFOCOM, SIGMETRICS, E-Energy, IoTDI, SEC, and IWQOS*.

Education

2019–Now	**MS'23/PhD, Computer Science**, *University of Massachusetts Amherst*, MA, USA.
	Cloud and Edge Computing, Green Computing, Energy Informatics, and Machine Learning Systems.
Supervisor	Prof. Prashant Shenoy, LASS research lab.
2015–2018	**Masters of Computer Engineering**, *Faculty of Engineering*, Helwan University, Egypt.
	Cloud Computing, Elastic Infrastructures, Containers
Supervisors	Prof. Sameh Salem, Prof. Amr Mohamed.
Thesis Title	Container Type Virtualization Management in Cloud Computing.
2012	**Diploma in Information Technology**, *Major in System Development, Minor in Software Architecture*, Information Technology Institute (ITI), Egypt.
2006–2011	**BS of Computer Engineering (ClassValedictorian)**, Helwan University, Egypt.
Thesis	Assistive Drive System: Driver Behavior Monitoring using computer vision and ultrasonic sensors.

Research Experience

University of Massachusetts Amherst, Research Assistant

2021-Now	***Carbon-aware/Sustainable Computing***.
	Papers: ASPLOS'23, HotCarbon'23, SIGMETRICS/Performance 2024, ASPLOS'24, E-Energy'24
	Designed and Implemented Carbon and Energy aware system monitoring and management solutions that help reduce the carbon footprint of computing.
2020-Now	***Model-Serving on The Edge***, *Papers: WEEE'21, TAAS'23, IoTDI'23, SEC'23, MilCom'23*.
	Designed and Implemented Model-Serving platforms that adapt to workload and environment dynamics while providing fairness, resiliency, and latency guarantees.

Nokia Bell Labs, Network Systems Research Department, Summer Intern

2022	***Low-Latency Model Serving***, *Papers: IWQOS'23*.
	Designed a low latency model serving framework using RDMA and GPUDirect RDMA.
2021	***Telemery system***, *Patent: US20230246931A1, Papers: INFOCOM'24*.
	Designed an End-to-End telemetry system for RDMA network traffic

Public University of Navarra, Spain, Research Assistant (Funded by ERASMUS+)

2018	***Solar Panels anomaly detection***, *Papers: ICENCO'19*.
	Cleanliness detection of Solar Panels using computer vision and machine learning.

Helwan University, Research Assistant

2015-2019 *Containers Clusters Management*, *Papers: ICENCO'17, ICCES'17, IEEE Access'19*.
Developed elasticity control/load balancing algorithms for containers as a service cloud.

Publications and Patents

2024 **Walid A. Hanafy**, Qianlin Liang, Noman Bashir, Abel Souza, David Irwin, and Prashant Shenoy. Going Green for Less Green: Optimizing the Cost of Reducing Cloud Carbon Emissions. In *29th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, Volume 3 (ASPLOS '24), April 27-May 1, 2024, La Jolla, CA, USA*, 2024.

2024 Hyunseok Chang, **Walid A. Hanafy**, Sarit Mukherjee, and Limin Wang. INSERT: In-Network Stateful End-to-End RDMA Telemetry. In *IEEE Conference on Computer Communications*, INFOCOM'24, 2024.

2024 Roozbeh Bostandoost, Adam Lechowicz, **Walid A. Hanafy**, Noman Bashir, Prashant Shenoy, and Mohammad Hajiesmaili. LACS: Learning-Augmented Algorithms for Carbon-Aware Resource Scaling with Uncertain Demand. In *The 15th ACM International Conference on Future and Sustainable Energy Systems (E-Energy '24), June 4–7, 2024, Singapore, Singapore*, 2024.

2023 **Walid A. Hanafy**, Li Wu, Tarek Abdelzaher, Suhas Diggavi, and Prashant Shenoy. Failure-Resilient ML Inference at the Edge through Graceful Service Degradation. In *Proceedings of the 41st IEEE Military Communications Conference (MILCOM) workshop on Internet of Things for Adversarial Environments*, 10 2023.

2023 **Walid A. Hanafy**, Limin Wang, Hyunseok Chang, Sarit Mukherjee, T. V. Lakshman, and Prashant Shenoy. Understanding the Benefits of Hardware-Accelerated Communication in Model-Serving Applications. In *2023 IEEE/ACM 31st International Symposium on Quality of Service (IWQoS)*, IWQoS'23, pages 1–10, 2023.

2023 **Walid A. Hanafy**, Qianlin Liang, Noman Bashir, David Irwin, and Prashant Shenoy. CarbonScaler: Leveraging Cloud Workload Elasticity for Optimizing Carbon-Efficiency. *Proc. ACM Meas. Anal. Comput. Syst.*, volume 7. Association for Computing Machinery, dec 2023.

2023 **Walid A. Hanafy**, Roozbeh Bostandoost, Noman Bashir, David Irwin, Mohammad Hajiesmaili, and Prashant Shenoy. The War of the Efficiencies: Understanding the Tension between Carbon and Energy Optimization. In *Proc. 2nd ACM Workshop on Hot Topics in Sustainable Computing Systems (HotCarbon'23)*, July 2023.

2023 Abel Souza, Noman Bashir, Jorge Murillo, **Walid A. Hanafy**, Qianlin Liang, David Irwin, and Prashant Shenoy. Ecovisor: A Virtual Energy System for Carbon-Efficient Applications. In *Proceedings of the 28th ACM International Conference on Architectural Support for Programming Languages and Operating Systems*, volume 2 of *ASPLOS 2023*, page 252–265, 2023.

2023 Qianlin Liang, **Walid A. Hanafy**, Noman Bashir, David Irwin, and Prashant Shenoy. Energy Time Fairness: Balancing Fair Allocation of Energy and Time for GPU Workloads. In *Proceedings of the 8th ACM/IEEE Symposium on Edge Computing (SEC)*, 12 2023.

2023 Qianlin Liang, **Walid A. Hanafy**, Noman Bashir, Ahmed Ali-Eldin, David Irwin, and Prashant Shenoy. Dĕlen: Enabling Flexible and Adaptive Model-serving for Multi-tenant Edge AI. In *Proceedings of IEEE/ACM Eighth International Conference on Internet-of-Things Design and Implementation (IoTDI), San Antonio*, 5 2023.

2023 Qianlin Liang, **Walid A. Hanafy**, Ahmed Ali-Eldin, and Prashant Shenoy. Model-driven Cluster Resource Management for AI Workloads in Edge Clouds. *ACM Transactions on Autonomous and Adaptive Systems*, volume 18, pages 1–26, 2023.

2023 Hyunseok Chang, Limin Wang, Sarit Mukherjee, and **Walid Abdelrahman**. End-to-End RDMA Telemetry System, 2023. Patent US20230246931A1.

2021	**Walid A. Hanafy**, Tergel Molom-Ochir, and Rohan Shenoy. Design Considerations for Energy-Efficient Inference on Edge Devices. In *Proceedings of International Workshop on Energy-Efficient Learning at the Edge*, WEEE'21, page 302–308, 2021.
2019	**Walid A. Hanafy**, Alfredo Pina, and Sameh A. Salem. Machine Learning Approach for Photovoltaic Panels Cleanliness Detection. In *2019 15th International Computer Engineering Conference (ICENCO)*, pages 72–77, 2019.
2019	**Walid A. Hanafy**, Amr E. Mohamed, and Sameh A. Salem. A New Infrastructure Elasticity Control Algorithm for Containerized Cloud. *IEEE Access*, volume 7, pages 39731–39741, 2019.
2017	**Walid A. Hanafy**, Amr E. Mohamed, and Sameh A. Salem. Novel Selection Policies for Container-based Cloud Deployment Models. In *2017 13th International Computer Engineering Conference (ICENCO)*, pages 237–242, 2017.
2017	**Walid A. Hanafy**, Amr E. Mohamed, and Sameh A. Salem. A Load Balancing with Power Optimization Algorithm for Container-based Infrastructure Management. In *2017 12th International Conference on Computer Engineering and Systems (ICCES)*, pages 161–166, 2017.

Development Experience

2017-2019 Testicide, Egypt, Research Engineer

Designed a microservices system that implements the startup novel "codeless" GUI testing framework.

Tools: Azure Service Fabric, CosmosDB, AngualrJS

2016-2017 IT-Bits, UAE, Software Engineer

Led the successful development of software solutions for multiple pharmaceutical companies.

Tools: Asp.net Core, MSSQL server, Angualr

2016-2017 Consukorra-PES, Egypt, Software Engineer

Design and Implement a GIS-based data collection platform, leading to a 200% speedup in the collection process

Tools: QGIS, PostgreSQL, .net framework

Teaching Experience

University of Massachusetts Amherst, Teaching Assistant

Spring 2023 COMPSCI 677: Distributed and Operating Systems

Spring 2020 COMPSCI 577: OS Design and Implementation

Information Technology Institute (ITI), Visiting Lecturer

2015-2019 Design and teach courses in Software Design, Cloud Computing, and Software Architecture

Technologies: Microsoft Stack, Microsoft Azure, and Docker *multiple recurrent courses*

Helwan University, Teaching Assistant

2015-2019 Software Engineering, Database Systems, Operating Systems, and Distributed Systems

Achievements & Recognitions

2021 **Outstanding Innovation Award** for my internship from *Nokia Bell Labs*, USA.

2012 Winner of **ICT4Change** for my ITI graduation project from *ICT Ministry*, Egypt.

2011 **Young Innovators Award** for my BS graduation project from *Nahdet El Mahrosa*, Egypt.

Technical skills

Programming Python, C/C++, C#, Java

Web HTML 5, .net Stack, AngularJS

Database	MSSQL, PostgreSQL, MySQL, COSMOSDB
Cloud	VMware, Docker, and K8s
Testing	XUnit, Specflow, and Selenium
ML	Python Stack and Pytorch

Services

2020-2024	**UMass Muslim Student Association**, *Grdauates Branch*, Treasurer.
2021	**Artifcat Evaluation Committe Memeber**, *Eurosys 2021*.
2017	**Docker Egypt Meetup**, *Tutorials on containers*, Funded by Microsoft and Docker, Egypt.