Syllabus for CS 4950 Independent Study

Introduction:

As more data is generated by network edge devices, sending those data to a distant cloud for processing might not be efficient, or might even be infeasible in some cases due to bandwidth constraints. Additionally, as time-sensitive and location-aware applications emerge, the distant cloud will not be able to satisfy the ultra-low latency requirements of these applications. Hence a new way of computing paradigm that could satisfy those requirements must be introduced.

Course Description:

In this course, students will learn about basic concepts and architectures of fog computing, which includes but is not limited to edge computing, mobile ad hoc cloud computing, multi-access edge computing, and so on. Students will also learn about some real-world applications that utilize fog computing architecture. By the end of this class, students are expected to implement a simple application that realized the concepts they learn from this class. Students are also expected to write a report to reflect their learning at the end of the class.

Class Schedule:

Week 1: Basic concepts of fog computing: What is fog computing? What are some other computing paradigms it includes?
Papers: TBD

Week 2: Frameworks and programming models: Fog/edge architectures and designs
Papers:

1. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8030322
2. https://ieeexplore.ieee.org/document/8114498

Week 3: Frameworks and programming models: Fog/edge architectures using 5G
Papers:

1. https://ieeexplore.ieee.org/document/8114566
2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7931566
3. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7981547

Week 4: Resource management and provisioning: service provisioning, service migration, and orchestration
Papers:

1. https://link.springer.com/article/10.1007/s11761-017-0219-8
2. https://ieeexplore.ieee.org/document/7830702
3. https://ieeexplore.ieee.org/document/7867735
4. https://www.researchgate.net/publication/307636184_SDFog_A_Software_Defined_Computing_Architecture_for_QoS_Aware_Service_Orchestration_over_Edge_Devices

Week 5: Resource management and provisioning: Provisioning of resource-limited IoT devices and handover
Papers:

1. https://ieeexplore.ieee.org/abstract/document/8071529
2. https://ieeexplore.ieee.org/abstract/document/8039523
3. https://ieeexplore.ieee.org/abstract/document/8114552
4. https://dl.acm.org/doi/pdf/10.1145/3132211.3134453

Week 6: Fog/edge real-world applications: Image and face recognition
Papers:

1. https://ieeexplore.ieee.org/document/7979974
2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7563449

Week 7: Fog/edge real-world applications: Artificial intelligence and machine learning
Papers:

1. https://ieeexplore.ieee.org/document/7774674
2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7979979

Week 8: Fall break

Week 9: Operation: Scheduling, offloading, and load balancing
Papers:

1. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8246720
2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8270631
3. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7830702

Week 10: Fog/edge real-world applications: P2P Systems and fault-tolerant application development
Papers:

1. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1382809
2. https://dl.acm.org/doi/pdf/10.1145/581571.581573
3. https://ieeexplore.ieee.org/document/6903458
4. https://ieeexplore.ieee.org/document/8368528

Week 11: Fog/edge security and privacy
Papers:

1. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7849185
2. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7835115

Week 12: Challenges and future research directions, the wrap
Paper:

1. https://dl.acm.org/doi/pdf/10.1145/2831347.2831354

Week 13: Final Project

Week 14: Final Project

Week 15: Reflection