Ph.D. in Mathematics and Computer Science

Academic year 2024/2025

GREEN FEDERATED LEARNING

Dipanwita Thakur- University of Calabria

THE RAPID ADVANCEMENT OF AI IS BEING DRIVEN BY INCREASINGLY LARGE AND COMPUTATIONALLY INTENSIVE MACHINE LEARNING MODELS AND DATASETS. AS A RESULT, THE AMOUNT OF COMPUTING POWER USED TO TRAIN STATE-OF-THE-ART MODELS IS GROWING EXPONENTIALLY, DOUBLING APPROXIMATELY EVERY 10 MONTHS BETWEEN 2015 AND 2022. THIS TREND IS LEADING TO A SIGNIFICANT CARBON FOOTPRINT. FEDERATED LEARNING (FL) IS A COLLABORATIVE MACHINE LEARNING TECHNIQUE THAT TRAINS A CENTRALIZED MODEL USING DATA FROM DECENTRALIZED ENTITIES. HOWEVER, FL CAN ALSO BE RESOURCE-INTENSIVE AND CONTRIBUTE TO A SUBSTANTIAL CARBON FOOTPRINT, ESPECIALLY WHEN DEPLOYED AT SCALE. UNLIKE CENTRALIZED AI, WHICH CAN ACCESS RENEWABLE ENERGY AT STRATEGICALLY LOCATED DATA CENTERS, CROSS-DEVICE FL MAY UTILIZE HUNDREDS OF MILLIONS OF GLOBALLY DISTRIBUTED END-USER DEVICES WITH DIVERSE ENERGY SOURCES. THIS COURSE INTRODUCES STUDENTS TO THE FUNDAMENTALS AND RECENT ADVANCES IN FEDERATED LEARNING, WITH A FOCUS ON REDUCING COMMUNICATION COSTS, IMPROVING COMPUTATIONAL EFFICIENCY, AND ENHANCING SECURITY. FEDERATED LEARNING IS A DISTRIBUTED MACHINE LEARNING PARADIGM THAT ENABLES MODEL TRAINING ON A LARGE BODY OF DECENTRALIZED DATA. ITS GOAL IS TO MAKE FULL USE OF DATA ACROSS ORGANIZATIONS OR DEVICES WHILE MEETING REGULATORY, PRIVACY, AND SECURITY REQUIREMENTS. ADDITIONALLY, THIS COURSE INTRODUCES GREEN FEDERATED LEARNING, WHICH IS A NEW PARADIGM FOR RESEARCHERS INTERESTED IN WORKING ON ENERGY-EFFICIENT AI SYSTEMS OR SOLUTIONS

MON 09/12   TUE 10/12
WED 11/12   THU 12/12

CUBO 30 B - 2 ND FLOOR - MT 12

14:00 - 17:00