RESEARCH PROJECTS

Ali Dewan, PhD

Associate Professor

School of Computing and Information Systems

Faculty of Science and Technology

Athabasca University

adewan@athabascau.ca

Focused on the future of learning.

Outline

1. Research interests
2. Application area
3. Some ongoing research projects
4. Funding support

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1. Research Interests

- Artificial Intelligence
- Machine Learning
- Deep Learning
- Affective Computing
- Image Processing
- Computer Vision
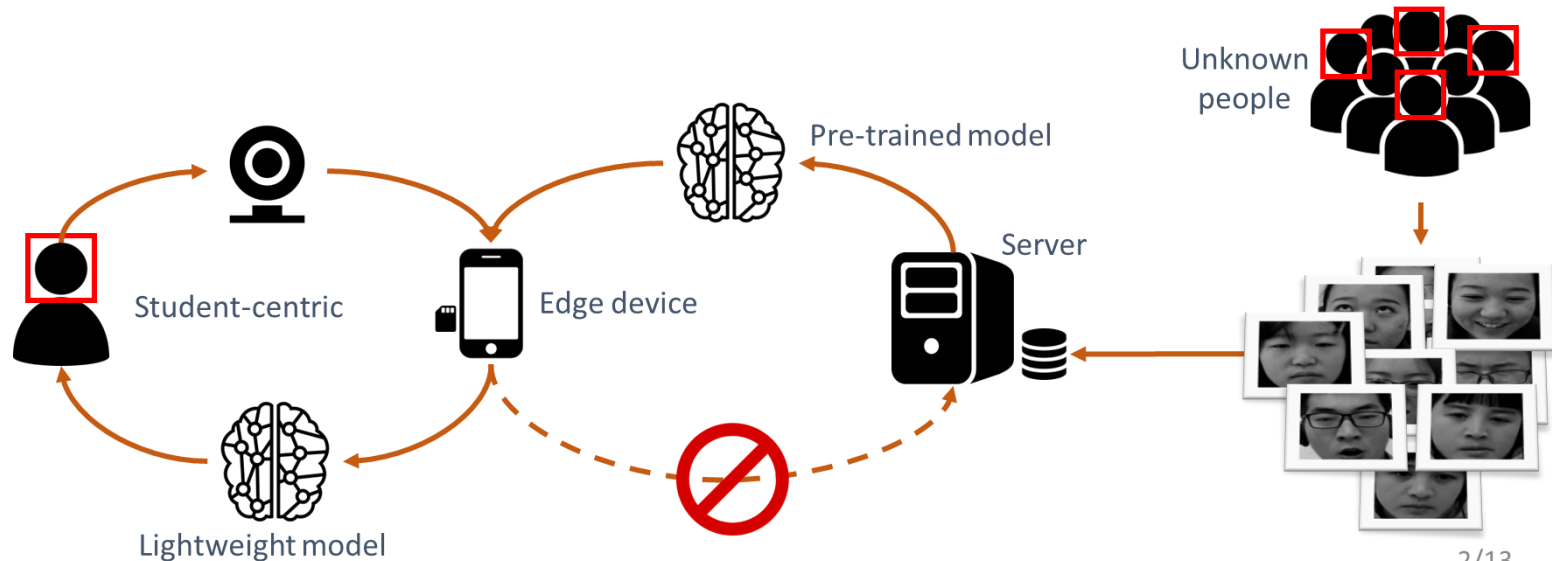
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2. Application Area

- **Education**
  - Educational emotion detection
  - Cognitive engagement detection
  - Educational dashboard design
  - Automated scoring
- **Healthcare**
  - Interoperability
  - Predictive analytics
  - Medical image analysis
- **Environment**
  - Land use land cover analysis
  - River flow prediction
- **Industry and Manufacturing**
  - Listing images for short-term rental
  - Improving critical controls using IoT and CV
  - Driver distraction classification

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3.1. Educational Emotion Detection

- A lightweight and interpretable CNN architecture
- Protecting student privacy
- Accountable and trustworthy

- Confusion
- Distraction
- Enjoyment
- Neutrality
- Fatigue

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3.2. Behavioral Engagement Detection

Micro-sleep tracking with 3D facial mesh

Yawn detection using facial landmarks
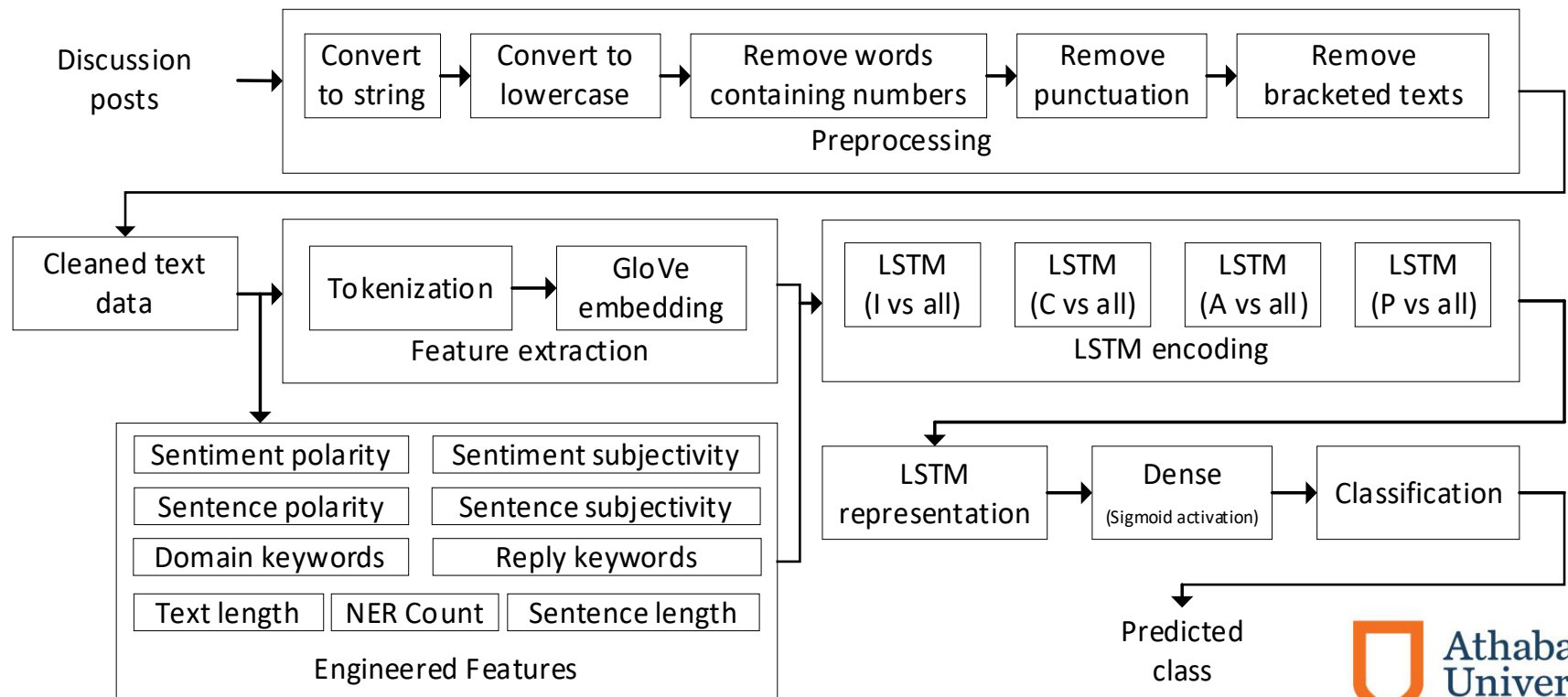
Facial Emotion Detection Using 2D and 3D CNNs

Iris movement detection to identify distraction

- On Task Behavior
- Off Task Behavior

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3.3. Cognitive Engagement Detection

Interactive, constructive, active, and passive (ICAP) framework
- Conceptualizes hierarchical cognitive engagement levels
- higher levels are related to higher cognitive engagement and learning growth
- From top to bottom, the order of cognitive engagement levels is
    - interactive
    - constructive
    - active
    - passive

3.4. "Health Everywhere" MIF Project
(with Dr. Dunwei Wen)

- Workplace safety data analysis
- Word sense disambiguation of healthcare textual data
- Automated medical coding system
- Multilingual medical information retrieval

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5. Funding Supports

Thank You!

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