



Athabasca
University

RESEARCH PROJECTS

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**Focused on the future of
learning.**

Outline

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

1. Research Interests

- Artificial Intelligence (in Education)
- Machine Learning
- Deep Learning
- Affective Computing
- Image Processing
- Computer Vision

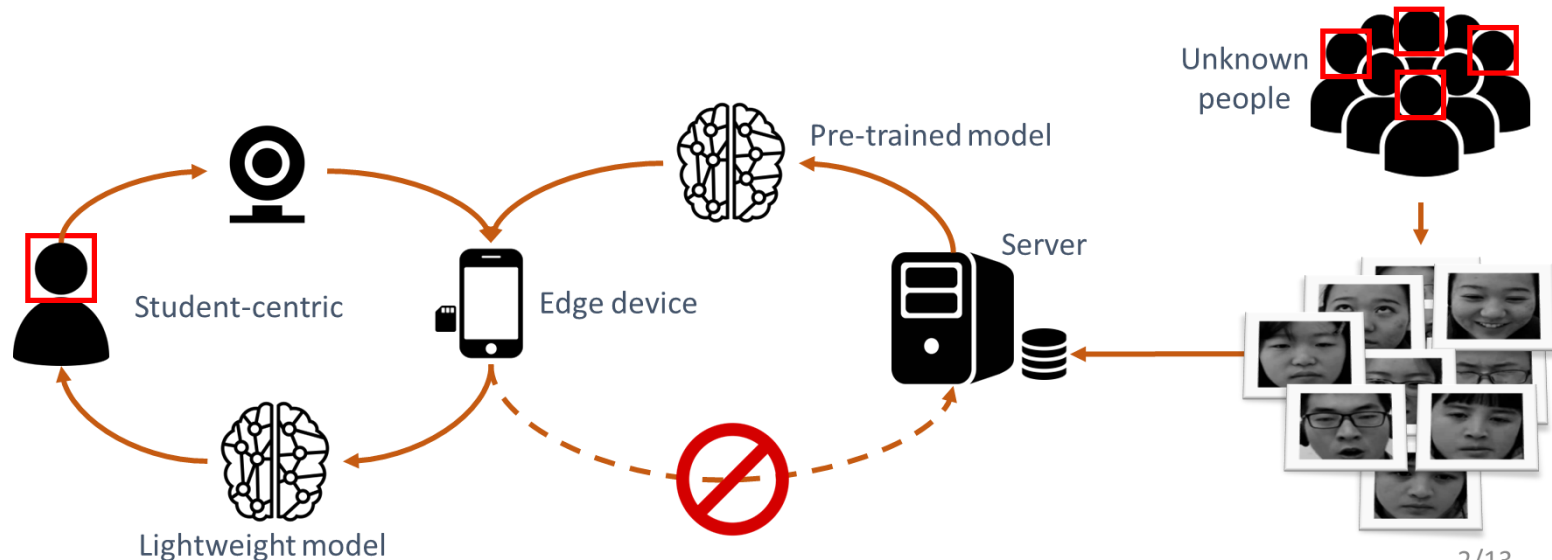
2. Application Area

- **Education**
 - educational emotion detection
 - student engagement detection
 - adaptive learning
 - personalized learning
 - educational dashboard design
- **Healthcare**
 - interoperability
 - predictive analytics
 - medical image analysis
- **Environment**
 - land use land cover analysis
 - river flow prediction
- **Manufacturing**
 - listing images for short-term rental
 - improving critical controls using IoT and CV
 - driver distraction classification

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

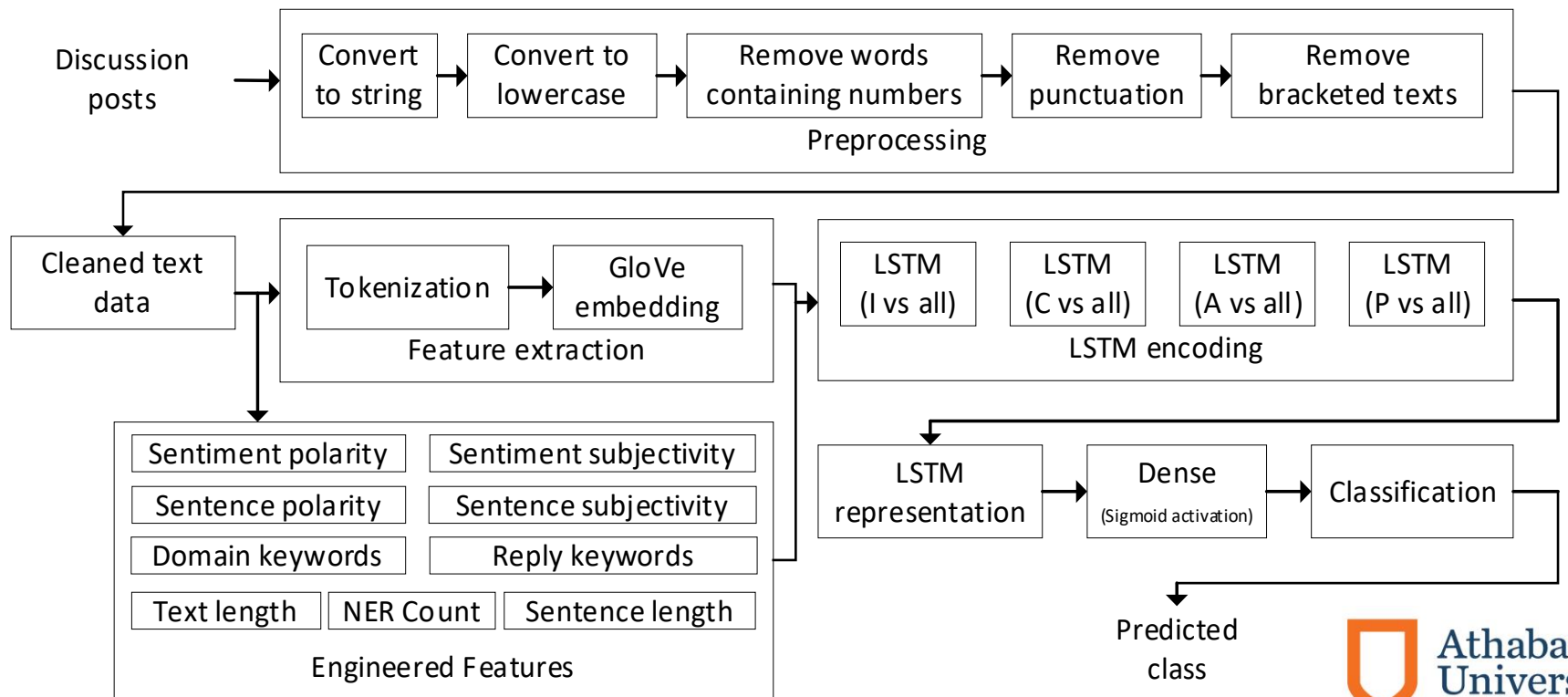
Iris movement detection to identify distraction

- On Task Behavior
- Off Task Behavior

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

5. Funding Supports



Thank You!