

# Using AI for Privacy to Personalize Education

ATI 790 - AI in Education

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# The Call

## Neurodiversity Challenges

Students with neurodiverse traits face greater challenges in college, lower motivation, and increased risks of success impairment under cognitive load.

These issues are worsened by digital learning environments that often overlook their unique needs.

## Cognitive Load and Success

Cognitive load and emotional well-being are closely linked to academic achievement.

When learners struggle to manage cognitive load, they experience increased stress and anxiety, which can negatively impact their motivation and performance.

# The Action: Create a Framework for Digital Cognitive Accessibility

1

A framework that bridges evidence-based cognitive strategies with personalized instructional design to foster cognitive accessibility in digital learning platforms does not exist.

2

This underscores the pressing need for innovative solutions in this area. We propose a framework that addresses the unique challenges faced by neurodiverse learners in digital learning environments.

3

The framework consists of four interconnected components: **Cognitive Load Management, Neurodiversity-Informed Design, Adaptive Learning Technologies, and Continuous Assessment & Refinement.**

# My Framework: Neuro-Informed Instructional Design (NI2D)

## The 4 Pillars of Digital Cognitive Accessibility



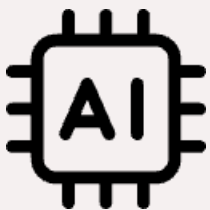
### Cognitive Load Management

Focuses on managing cognitive load through evidence-based strategies like chunking information, providing clear instructions, and incorporating visual aids.



### Neurodiversity-Informed Design

Emphasizes creating learning environments that are tailored to the specific needs of neurodiverse learners and account their unique learning styles, strengths, & challenges.



### Adaptive Learning Technologies

Leverages AI-powered technologies to personalize learning experiences, provide adaptive assistance, and continuously assess learner progress.



### Continuous Assessment and Refinement

Involves ongoing evaluation of the framework's effectiveness, collecting feedback from learners and educators, and iteratively refining the framework based on real-world data.

# Complexities in Adopting AI

## 1. Ethical Adoption

Careful consideration of the ethical implications of using AI in education, ensuring that AI is used responsibly and ethically.

## 2. Adaptation and Integration

Adapting and integrating AI technologies in a way that respects the rights and needs of neurodiverse learners.

## 3. Data Protection

Protecting the privacy and security of learner data, ensuring transparency and accountability in the use of AI.

## 4. Awareness and Ownership

Promoting awareness and understanding of AI among learners, empowering them to engage with AI in a meaningful and responsible way.

# *Analysis, Modeling, and Design of Personalized Digital Learning Environments*

Khanal, S. & Pokhrel, S. R. (2024). Analysis, modeling and design of personalized digital learning environment. ArXiv. <https://doi.org/10.48550/arXiv.2405.10476>

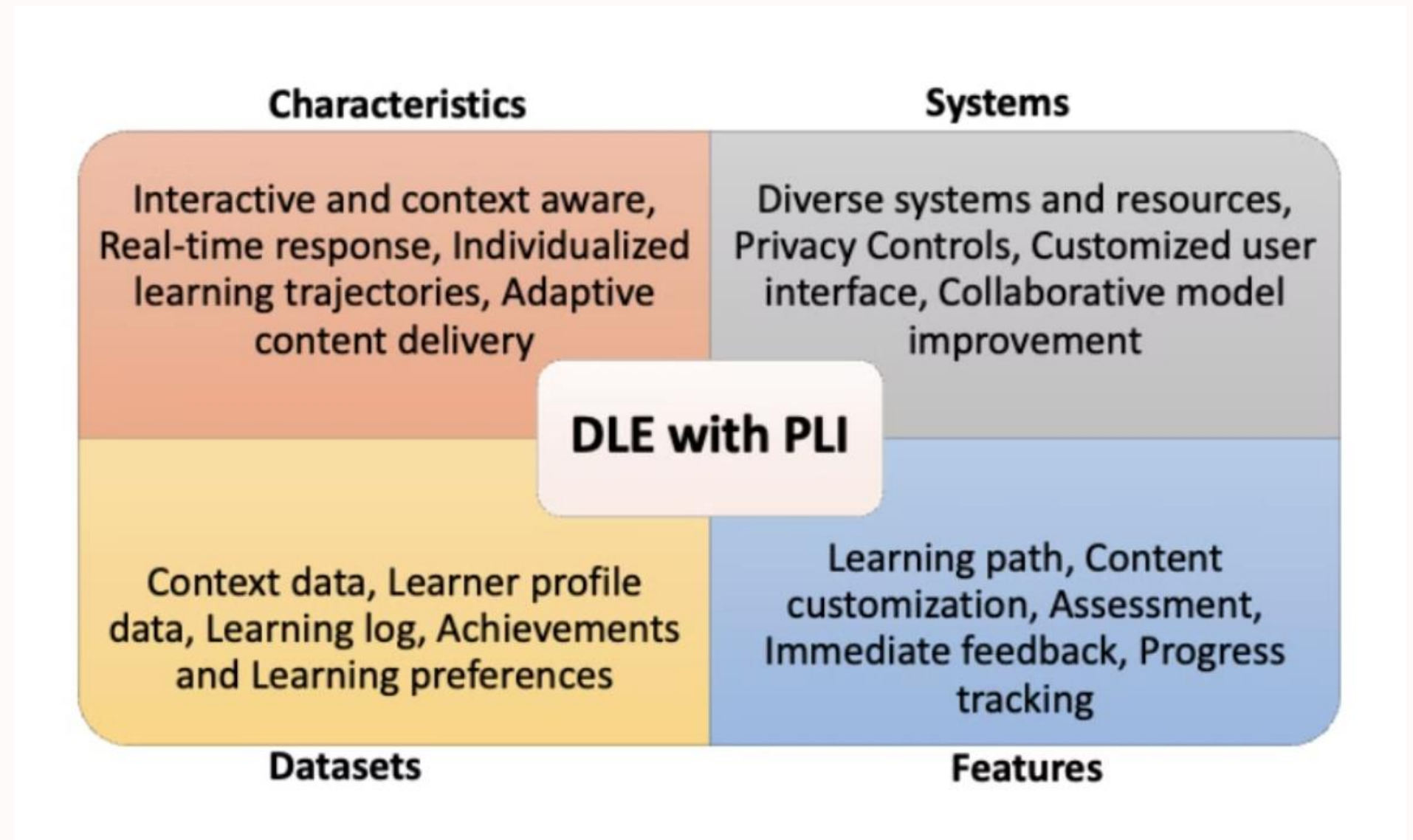


# Framework: Digital Learning Environment (DLE) with the Private Learning Intelligence (PLI)

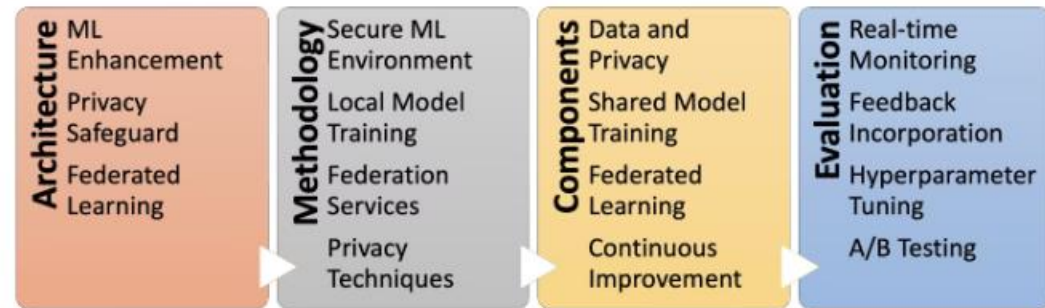
It has the potential to ensure privacy while personalizing education.

## Key Benefits

- Robust privacy protection
- Personalized learning
- Real-time experiences



# Approach



## 4 Stages of Implementation

1. enhancing ML for federated contexts
2. ensuring privacy through techniques like differential privacy
3. training models locally
4. continuous system improvement through real-time monitoring and testing.

### Sandboxing

Emphasizes sandboxing techniques for secure ML environments and federated learning for collaborative model training without compromising user privacy.

### Uses Federated Machine Learning

The PLI framework employs federated machine learning. It creates and refines personalized learning models for each student by constructing autonomous models.

### Transparency

Implementation details are publicly available. To promote transparency and reproducibility, the implementation details are public via GitHub: <https://github.com/pli-research-d/Secure-ML-with-BERT>



# Significance

This research addresses the need for adaptive and private learning. It sets a path for the future of education.

1

## Advancement

Significant advancement in DLE capabilities.

2

## Transformation

Offers a transformative approach to personalized learning.

3

## Foundation

Establishes a foundation for seamless integration.

# Core Implementation Challenges



## Data Privacy Management

Balancing learner analytics with regulations



## Computational Scalability

Processing multi-modal learner data in real-time



## Ethical AI Governance

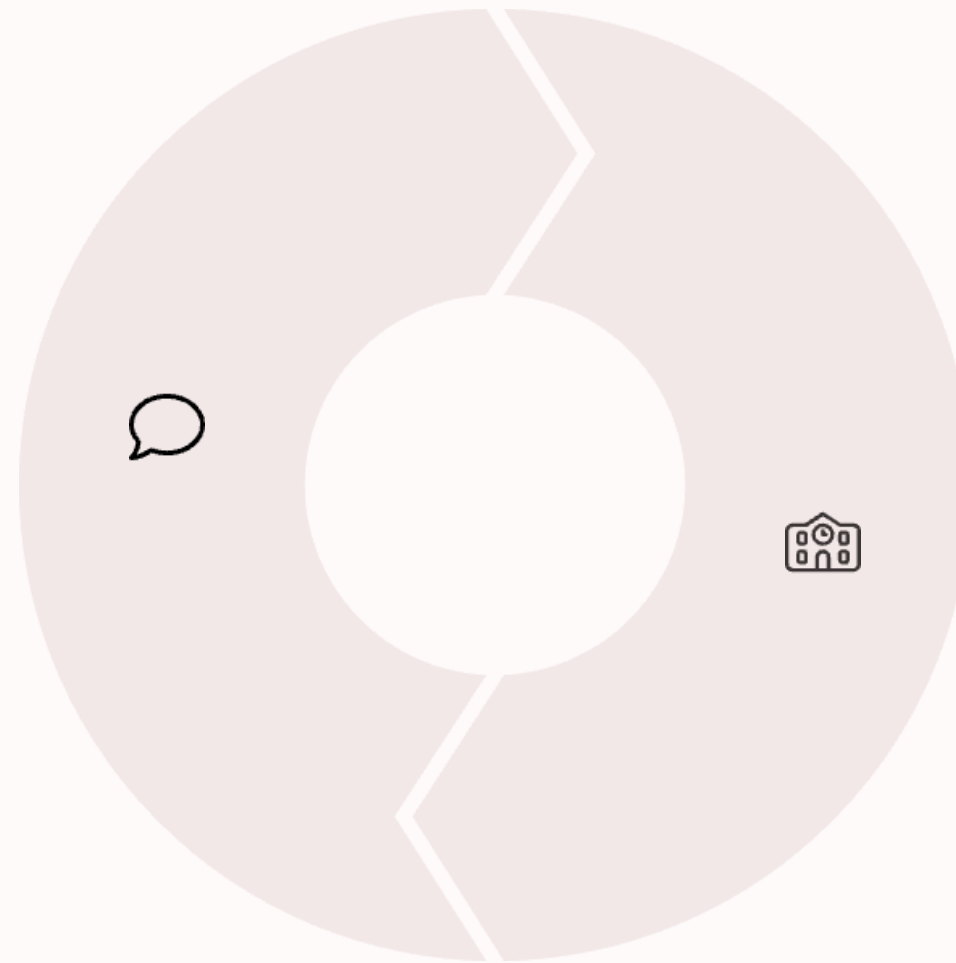
Mitigating algorithmic bias

# Integration Hurdles

## Curriculum Alignment

Reconciling self-paced learning with standardized assessments

Automated sequencing must preserve curriculum



## Educator Capacity

Transitioning teachers to learning orchestrators

Educators need new skills to navigate real-time data.

# Technical Challenges

Integration with legacy systems



Gaps in multi-vendor IoT device standardization





# Looking Ahead

The PLI framework offers a potential solution. Yet, maintaining engagement across subgroups remains a challenge.



Technological Solution



Engagement Equality

*Questions ?*