



# **Enhancing Early Alzheimer's Detection with Machine Learning**

# The Challenge

Augnition partnered with the UCI Translational Neuroscience Lab, led by Prof. Michael Yassa, to develop a Machine Learning (ML) framework capable of evaluating cutting-edge Alzheimer's early detection research. However, the project faced significant data challenges:

- **Limited labeled data:** Diagnosing Alzheimer's requires expensive and invasive clinical procedures, resulting in a low sample size of positively diagnosed patients.
- **Unlabeled data availability:** While additional patient data was available, it lacked diagnostic labels, making traditional supervised ML techniques less effective.
- **Previous ML limitations:** Prior approaches used leave-one-out validation, which provided ROC AUC metrics but did not generate a reliable predictive model for future data.
- **Scalability concerns:** Augnition aimed to productionize their diagnostic technique, requiring a robust, adaptable ML framework that could incorporate new research data and continuously improve accuracy.

# The Solution

Augnition engaged BigRio to design and implement a scalable ML framework capable of handling both limited labeled data and abundant unlabeled data to improve Alzheimer's early detection accuracy.

## BigRio's Three-Pronged ML Approach:

### 1. Diverse ML Models

- Implemented a RandomForest classifier and a Multilayer Perceptron (MLP) to analyze structured patient data.
- Developed a Variational Autoencoder (VAE) for semi-supervised learning, enabling the model to extract useful patterns from unlabeled data.

### 2. Data Standardization & Preprocessing

- Built a robust data preprocessing pipeline to standardize demographic data across multiple research partners.
- Established consistent data conventions for cognitive survey responses to improve data quality and model reliability.

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## The Outcome

BigRio delivered a production-ready ML framework that significantly enhanced Augnition's diagnostic capabilities:

- **Scalable & Future-Proof:** The ML pipeline is fully configurable to accept new data from research partners, ensuring long-term usability.
- **Improved Diagnostic Accuracy:** The model effectively utilizes both labeled and unlabeled data, enabling more reliable early Alzheimer's detection.
- **Standardized Data Inputs:** The system now processes cognitive survey data using standardized conventions, improving model consistency.
- **Empowered Research Team:** BigRio provided technical training to UCI lab personnel, allowing them to independently refine the ML framework and optimize their experimental workflow.

With this solution, Augnition is now positioned to accelerate Alzheimer's research, leveraging AI to detect early warning signs more efficiently and accurately than ever before.

# About BigRio

BigRio is a leading AI and Machine Learning consulting firm specializing in healthcare, life sciences, and enterprise AI solutions. We empower organizations with custom ML frameworks, scalable data pipelines, and AI-driven insights to drive innovation and impact.

## LET'S CONNECT

For more information on how BigRio can help you, contact us at [info@bigr.io](mailto:info@bigr.io) or [click here](#).

