

# Charles Kotula

MS Biomedical Data Science • BS Neurobiology & Computer Science

University of Wisconsin-Madison

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*Mission-driven ML developer with extensive experience using EHR data for clinical time-series modeling and multimodal deep learning. First-author publication on feature engineering using ICD-10 codes and SNOMED CT identifiers for deterioration prediction. Passionate about building scalable systems that save lives. Seeking a Machine Learning Developer role in healthcare or biotech.*

## Technical Skills

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- **Languages:** Python, SQL, Bash, JavaScript/TypeScript, Java
- **ML:** PyTorch, PyTorch Lightning, TensorFlow/Keras, HuggingFace, Optuna
- **Tools:** Git/GitHub/GitLab, Docker, Weights & Biases, FastAPI
- **Cloud:** AWS (EC2), Azure DevOps

## Experience

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### Research Assistant – UW-Madison ICU Data Science Lab

Spring 2024 – Fall 2025

- Built multimodal ML pipelines using PyTorch, PyTorch Lightning, TensorFlow/Keras, and HuggingFace to model ICU trajectories from structured EHR data and UMLS identifiers extracted from clinical notes.
- Conducted feature engineering for de-identified time-series data with missing values across hundreds of thousands of patient encounters.
- Collaborated directly with ICU physicians and clinical informatics researchers to define model objectives, interpret model behavior, and validate clinical relevance.
- First-author JMIR publication on feature engineering for unstructured EHR data using UMLS identifiers and ICD-10 codes (see “Selected Publication” below).

### Information Technology Intern – West Bend Insurance Company

Summer 2023

- Improved and deployed full-stack features using React (TS), C#, SQL, and Azure DevOps pipelines.
- Collaborated with a fast-paced Agile team to move software solutions to production

### Undergraduate Research Assistant – UW-Madison Suzuki Lab (ALS Neurobiology)

Fall 2023

- Analyzed mouse spinal cord cross sections to investigate motor neuron characteristics in ALS
- Contributed to a publication in Frontiers in Neuroscience

### Undergraduate Research Assistant – UW-Madison Plante Lab (Sleep Research)

Spring 2023

- Prepare actigraphy data for comparing healthy controls to participants with reported hypersomnia

## Projects

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### Pathology Foundation Model Fine-Tuning & Evaluation (2025)

- Fine-tuned Kaiko AI’s Midnight-12k pathology foundation model from Kaggle
- Explored model robustness to resolution changes and external datasets

### Muse ([muse.charliekotula.com](https://muse.charliekotula.com)) – AI-Powered Music Improvisation App (2025)

- Combined React TS with Python and Fast API to allow users to jam with a music language model

## Selected Publication

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### Kotula, C., et al. Journal of Medical Internet Research (JMIR) — 2025

“Comparison of Multimodal Deep Learning Approaches for Predicting Clinical Deterioration in Ward Patients: Observational Cohort Study”

- Used a multimodal LSTM model architecture to explore parameterization methods for UMLS concept unique identifiers (CUIs) for predicting clinical deterioration.
- Explored feature engineering and embedding techniques for CUIs, including using SapBERT embeddings and vector representations of ICD-10 code clusterings.