Example Project Ideas

Past Successes

- Sepsis prediction using EHR
- Diabetic retinopathy screening
- Medication adherence chatbot
- Cancer subtype classification

Project Categories

- Diagnostic tools
- Clinical decision support
- Patient engagement apps
- Drug discovery pipelines

Scope Examples

- Too broad: "Cure cancer with AI"
- Too narrow: "Clean one dataset"
- Just right: "Predict ICU readmission risk"

Impact Demonstrations

- Performance benchmarks
- Clinical utility analysis
- Cost-effectiveness estimates
- Stakeholder feedback

Publication Potential: Top projects may lead to conference papers or journal publications with instructor

Category 1: Diagnostic Tools

Key Applications

AI-Powered Diagnosis

Automated analysis of medical images, signals, and biomarkers to assist healthcare professionals in disease detection

Computer Vision | Deep Learning | CNN/Transformers

Key Applications

Medical image analysis (X-rays, CT, MRI, histopathology), biosignal processing (ECG, EEG), and lab result interpretation for early disease detection and diagnosis assistance.

Project Approach

Develop classification or segmentation models using annotated medical datasets. Focus on specific diseases or anatomical regions. Validate performance against radiologist/pathologist benchmarks.

Example Project:

"Automated detection of pneumonia in chest X-rays using transfer learning with ResNet-50, achieving 94% accuracy on validation set"

85-95%	2-4 weeks
Typical Accuracy	Development Time

Category 2: Clinical Decision Support

Intelligent Clinical Guidance

Risk prediction models and recommendation systems that help clinicians make evidence-based treatment decisions

Machine Learning | EHR Analytics

Key Applications

Predicting patient outcomes (readmission, mortality, complications), treatment response forecasting, resource allocation optimization, and personalized care pathway recommendations.

Project Approach

Build predictive models using EHR data with features like demographics, vitals, lab values, medications. Implement explainable AI techniques (SHAP, LIME) for clinical interpretability.

Example Project:

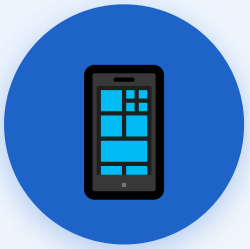
Risk Modeling

"30-day hospital readmission prediction for heart failure patients using MIMIC-III data with interpretable gradient boosting model"

0.75-0.85
Target AUROC

3-5 weeks
Development Time

Category 3: Patient Engagement Apps



Digital Health Solutions

Interactive applications that empower patients to actively participate in their healthcare journey and improve outcomes

NLP/LLMs | Mobile Dev | Behavioral AI

Key Applications

AI chatbots for symptom checking, medication adherence systems, personalized health education, mental health support tools, and chronic disease self-management platforms.

Project Approach

Design user-friendly interfaces with AI-powered conversational agents or recommendation engines. Incorporate behavioral psychology principles and gamification for sustained engagement.

Example Project:

"AI-powered diabetes management chatbot using RAG with clinical guidelines, tracking diet/glucose levels, providing personalized nutrition advice"

70-80%
User Satisfaction

4-6 weeks
Development Time

Category 4: Drug Discovery Pipelines

Computational Drug Design

ML-accelerated approaches to identify promising drug candidates, predict molecular properties, and optimize therapeutic compounds

Graph Neural Networks | Molecular ML | Bioinformatics

Key Applications

Molecular property prediction (toxicity, solubility, binding affinity), virtual screening of compound libraries, drug-target interaction modeling, and de novo molecule generation.

Project Approach

Use cheminformatics libraries (RDKit) and graph-based deep learning on molecular datasets. Predict ADMET properties or protein-ligand binding. Compare against established benchmarks.

Example Project:

"Graph convolutional network for predicting drug-protein binding affinity using BindingDB dataset, outperforming traditional docking methods"

$R^2 > 0.70$
Prediction Quality

4-6 weeks
Development Time

Keys to Project Success

Clear Problem Definition

- Identify specific clinical need or gap
- Define measurable success metrics
- Establish baseline performance
- Understand target end-users

Data Accessibility

- Use publicly available datasets (MIMIC, PhysioNet)
- Ensure sufficient sample size
- Check data quality and completeness
- Address class imbalance issues

Technical Feasibility

- Match complexity to timeline
- Leverage existing frameworks/models
- Plan for computational resources
- Build iteratively with milestones

Clinical Relevance

- Ground in real-world clinical workflows
- Consider implementation barriers
- Evaluate ethical implications
- Demonstrate actionable insights

Remember: The best projects balance technical innovation with practical clinical impact. Start small, validate often, and scale thoughtfully.