

Hopewell M.I.N.D. Prize Finalists

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Project Title: PENTOS-AI: Personalized neuroimaging-guided treatment decision support via dynamic outcome prediction for ischemic stroke using novel markers and artificial intelligence

Ischemic stroke happens when a blood clot blocks a brain vessel. It is a leading cause of death and disability worldwide. Fast treatments like clot-busting drugs and thrombectomy can help, but they also carry risks such as brain bleeding. Even with these options, half of all stroke patients never regain full independence. Within five years, one in five will have another stroke and one in three will develop dementia—one of the most feared outcomes. Thus, when a stroke happens, patients and families want personalized answers to four big questions to guide care decisions:

1. Will this person get better with treatment?
2. Will they be harmed by treatment (i.e. will they bleed?)
3. What is their risk of another stroke?
4. What is their risk of dementia?

Current prediction tools only give crude, fixed predictions for one of these outcomes at best. Doctors must juggle many separate scores that often ignore key details from brain scans and other treatment factors. That makes it very hard to give personalized advice as a patient's condition changes day to day.

Our research program, PENTOS-AI, will solve this problem by building AI models that use information from routine CT and MRI scans plus clinical data to predict functional recovery, bleeding, stroke recurrence, and dementia after stroke. These models will use automated imaging analysis tools we have built, and evaluate new risk markers that we have identified. We will train these models on large, detailed datasets. We will then confirm their predictions in ACT-GLOBAL, an international platform trial we are leading.

Finally, we will package our models into a simple digital tool that doctors can use at the bedside. We will test this tool with physicians and patients to obtain their feedback. PENTOS-AI will give stroke teams a way to get fast, accurate predictions that update as new information comes in about their patients. This will support clearer conversations, better shared decisions, and more personalized care plans.