



**Startup:** HIDENN-AI

**Startup Website:** <https://hidennai.wordpress.com/>

**Startup Description:**

Our team at HIDENN-AI is building HIDENN-SIM, an AI-powered engineering design platform that combines an engineering-focused AI chatbot with advanced physics-based AI-modeling to dramatically accelerate simulation and design. HIDENN-SIM enables the exploration of complex, high-dimensional problems through both data-driven AI training and cutting-edge data-free AI solvers, reducing design cycles from months or weeks to just days.

**Project Title:**

AI Engineering for Engineering Computational Mechanics

**Project Description:**

This internship focuses on the development and application of uncertainty-aware surrogate modeling techniques for computational mechanics. The intern will study the theoretical foundations of uncertainty-aware surrogate modeling, including its connection to classical Bayesian inference and Gaussian process, and gain hands-on experience implementing the algorithms in code. A central goal of the project is to support the integration of the uncertainty-aware surrogate modeling into commercial computer-aided engineering (CAE) software for large-scale thermofluidic simulations. The internship bridges machine learning, engineering simulation, and statistical analysis, providing exposure to both fundamental research and applied engineering workflows.

**Project Expectations:**

During the internship, the student is expected to:

- Develop a working understanding of uncertainty-aware surrogate modeling theory, including interpolating neural networks (INNs) and the Bayesian version of INN, B-INN, for uncertainty quantification.
- Implement and test core components of B-INN in Python environments.
- Assist in designing and implementing active learning strategies that use model uncertainty to guide adaptive sampling of computational simulations.
- Support the integration of B-INN and active learning pipelines with commercial CAE tools, such as finite element or finite volume solvers.
- Participate in regular technical discussions and document progress through reports, code, and presentations. The emphasis is on learning, contribution, and technical growth rather than prior mastery.



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### **Desired Candidate Experience:**

This position is intended for undergraduate students with an interest in computational engineering and artificial intelligence. Ideal candidates will have:

- Coursework or strong interest in engineering mechanics, applied mathematics, computer science, or related fields.
- Basic familiarity with numerical methods, finite element analysis, or computational physics.
- Experience with Python programming and scientific computing libraries (e.g., JAX, PyTorch).
- Introductory knowledge of machine learning or neural networks is preferred but not required.
- Curiosity, strong problem-solving skills, and motivation to work at the interface of AI and engineering simulation.

Prior exposure to Bayesian methods, uncertainty quantification, or CAE software is a plus but not mandatory.

### **Training & Mentoring Opportunities:**

The intern will receive close mentorship from executives of HIDENN-AI and research associates at Northwestern University with expertise in computational mechanics, machine learning, and uncertainty-aware modeling.

Training will include guided readings on interpolation and tensor decomposition theory, hands-on coding tutorials, and structured support for learning active learning concepts in engineering contexts. The intern will gain exposure to research-grade and industry-relevant CAE workflows, as well as best practices for developing scalable scientific software. This internship is designed to provide a strong foundation for future graduate study or careers in computational engineering, applied AI, or scientific computing.