

Interactive, Visualization-First AI Tutorials: An LLM-Guided Platform and an Interactive Demo for AI Literacy Across Georgia Tech

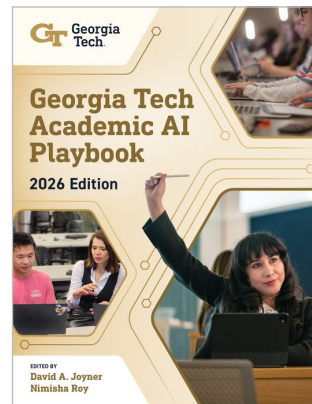
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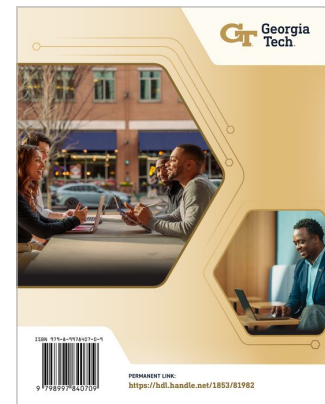
About the Playbook

The Georgia Tech Academic AI Playbook collects stories of how artificial intelligence is being used, taught, and responded to in Georgia Tech classrooms. The 2026 Edition gathers 67 articles from faculty, staff, and researchers across every college at Georgia Tech, along with the Library, the Center for Teaching and Learning, the Georgia Tech Research Institute, the Office of Information Technology, and the Provost’s Office.

Each article is a “play”: a specific initiative carried out in a real course, documenting the prior context, the actions the instructor took, the results, and the lessons learned. The volume closes with 20 lessons synthesized across the full collection.



Front cover



Back cover

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Title: Interactive, Visualization-First AI Tutorials: An LLM-Guided Platform and an Interactive Demo for AI Literacy Across Georgia Tech

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Categorization: Teaching AI

Sub-Categorization: AI Literacy for Non-Technical Audiences

Formation

This initiative built an interactive-tutorial ecosystem for teaching AI and machine learning at Georgia Tech, developed along two connected fronts: the AI First tutoring platform, created inside the AI Makerspace Nexus Vertically Integrated Projects (VIP) team as part of the Nexus 1.0 release line, and the FunML interactive online textbook that accompanies ECE 4252/6252 (Fundamentals of Machine Learning - FunML). The effort was kickstarted by the instructor and carried forward with VIP students, with support from the Franklin Foundation (John and Marilu McCarty Chair), Georgia Tech’s College of Engineering, the School of ECE, PACE, and the VIP program.

The motivating problem is familiar to anyone who has taught AI: foundational concepts are usually delivered through static slides and disconnected coding assignments. That format fails two audiences at once. Learners without a technical background are locked out entirely, they never get to see what a learning rate, a decision boundary, or a principal component actually does. And technically prepared students read the mathematics without acquiring the physical intuition for how the parameters move the behavior. In both cases the missing ingredient is the same: the ability to touch the concept, to manipulate its salient parameters and watch the consequences unfold graphically, immediately, in the browser.

The vision behind the initiative is therefore “first insight” through visualization: every lesson opens with a graphical motivation of the concept and its key parameters; learners build a mental model of the concept, its state parameters, and the corresponding code; and users can bring their own data for first-hand experience applying AI to problems they care about. The platform explicitly targets all campus members, regardless of technical background, an AI-literacy mission rather than a majors-only tool.

Deploying one pedagogy at two ends of the curriculum is the initiative’s defining choice: the same visualization-first, manipulate-the-parameters philosophy serves first exposure to AI on the tutoring platform and senior/graduate-level machine learning in FunML.

Action

The AI First tutoring platform. The VIP team built an LLM-empowered tutoring platform with a deliberate content pipeline: instructional materials are authored as Python notebooks, transformed into interactive slide-like modules, and run directly on Georgia Tech’s high-powered PACE compute nodes — so a learner needs nothing but a browser. Chat support is powered by Mistral and other open-source models; lessons combine markdown and LaTeX with executable code cells; live demonstrations include neural-network training and regression visualization; learner-centric zero-shot summaries personalize the

recap of completed lessons; and ingestion tools transform PDFs and PowerPoints into markdown lessons and RAG sources, so existing course materials can become interactive content. A rich dashboard captures each user's progress. Release 1.0 shipped with a linear-regression module, learners select 2- or 3-dimensional data, plot the regression, interact with its key parameters, and can view and edit the underlying Python with the graphics updating dynamically, and subsequent lessons extend to further machine learning topics, including an interactive variational-autoencoder course. Figures 1–3 show the deployed interface.

The tutoring platform is being expanded to foundational courses in ECE, CS, Physics, Chemistry, and Biology.

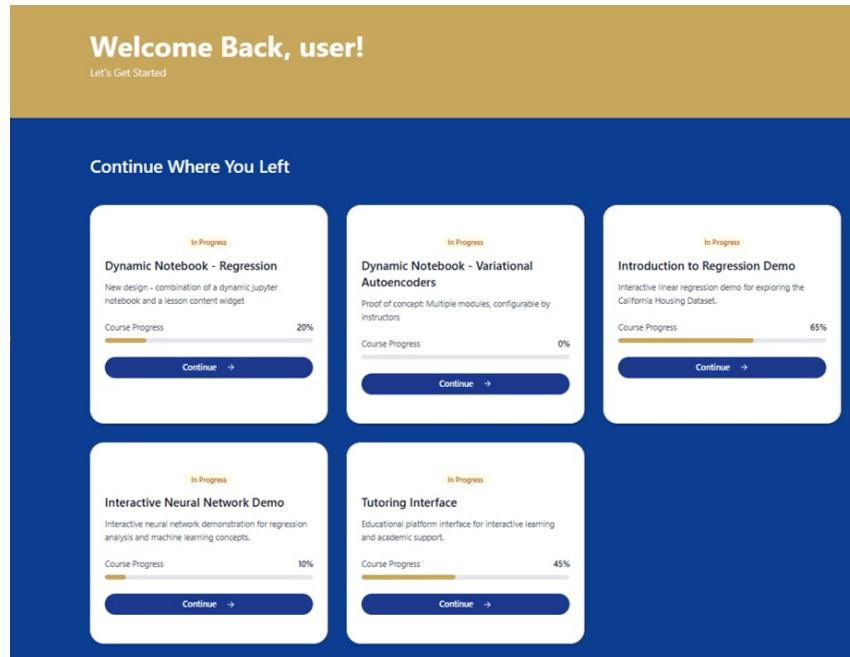


Figure 1: The user dashboard showing available courses and progress.

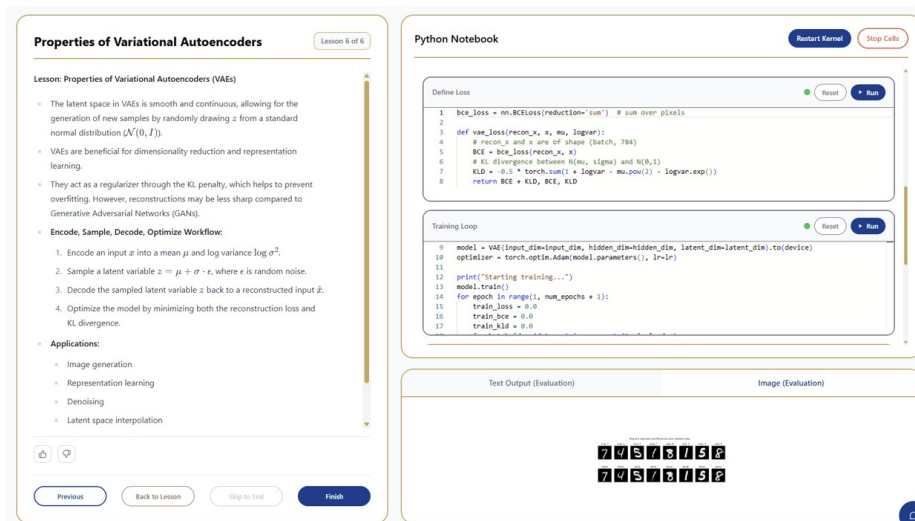


Figure 2: An interactive lesson from the variational autoencoder course with interactive code experiments.

The screenshot displays the Georgia Tech AI Learning Platform interface. On the left, a sidebar shows the course structure with sections: Section 1 (Introduction to Regression), Section 2 (Demo Notebook #1: Basic Tutorial), and Section 3 (Demo Notebook #2: Technical Assessment). The main content area is titled 'Intro to Regression' and shows 'Lesson 1 of 9'. It features an 'AI Summary' section with 'Key Concepts' (Primary Topic: Intro to Regression, Difficulty Level: Intermediate, Estimated Reading Time: 5-7 minutes) and 'Main Points' (1. Core Principles, 2. Mathematical Foundations). The 'Core Principles' section states: 'This lesson covers fundamental concepts that build upon previous knowledge. The material introduces key terminology and establishes foundational understanding necessary for advanced topics.' The 'Mathematical Foundations' section is partially visible. At the bottom, a navigation bar includes buttons for 'Previous', 'Back to Lesson', 'Skip to End', and 'Next'. An 'Overall Progress' indicator shows '0%'.

Figure 3: The automated AI summary and recap generated for completed course lessons.

The FunML interactive textbook. For ECE 4252/6252, the same philosophy was applied to an entire course: FunML is a public online textbook (olivesgatech.github.io/FunML) with 31 lecture sessions — spanning classification, regression, clustering, CNNs, autoencoders, sequence modeling and transformers, trustworthy ML (visual explainability, explanatory paradigms, uncertainty quantification, anomaly detection), data- and label-efficient learning, and large language and vision-language models — accompanied by slides, lecture notes, videos, exercises, and handouts. Crucially, the site embeds 60 browser-based interactive notebooks directly inside the lecture pages, with a searchable demo catalog: students click inside a plot to move a k-NN query point, drag a decision boundary, pick initial centroids and step through k-means iterations, race batch against stochastic and mini-batch gradient descent on a loss contour, and turn the polynomial-degree dial to watch the bias–variance trade-off play out (Table 1).

Table 1: The FunML interactive-demo catalog spans the full machine learning curriculum — 60 browser-based interactive notebooks embedded directly in the lecture pages of the ECE 4252/6252 online textbook.

FunML module	Example interactive demos (of 60 total)
Introduction & Classification	k-NN: click to move a query point and watch the classification update; drag a linear decision boundary; hinge loss and sigmoid explorers; single-layer perceptron example
Regression	Least-squares loss contours; batch vs. stochastic vs. mini-batch gradient descent; polynomial degree and the bias–variance trade-off; ridge regression under noise
Clustering & Dimensionality	K-means: pick initial centroids and step through assign/update iterations; PCA projection of a toy dataset; matrix transformations of the unit circle
Deep architectures	CNN training dynamics; convolutional and variational autoencoders; sequence modeling and transformers
Trustworthy ML & frontier topics	Visual explainability and explanatory paradigms; uncertainty quantification; anomaly detection; self-supervised and active learning; large language models

The team model. The initiative was kickstarted by the instructor and is carried by VIP students — the AI First tool page credits a student team including Ghazal Kaviani, who bridges the VIP effort and the FunML course materials — in a tight loop with the courses the tools serve: lessons and demos are authored against real course needs, deployed to real students, and revised from their feedback through the platform’s built-in feedback panel.

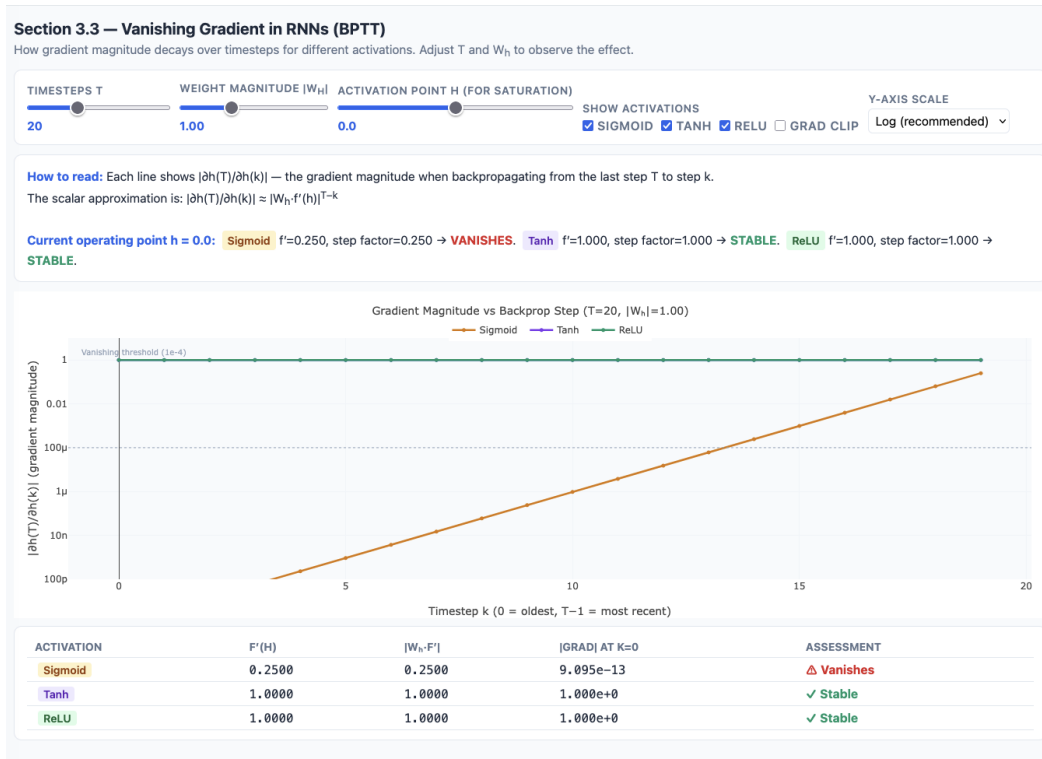


Figure 4: One screenshot of a FunML interactive demo

Result

The initiative's clearest result is coverage: one pedagogy now runs at both ends of the Georgia Tech AI curriculum. At the entry level, the AI First platform gives any campus member—regardless of technical background—a guided, hands-on first encounter with AI concepts, with LLM tutoring, executable lessons, and managed compute that removes every installation barrier. At the advanced level, FunML puts 60 interactive demonstrations inside the lecture pages of a full machine learning textbook for ECE 4252/6252, publicly accessible in the browser, spanning from k-NN to transformers, uncertainty quantification, and LLMs.

The structural results mirror those of the broader Nexus effort. Zero-install access: because lessons execute on PACE nodes (platform) or entirely in the browser (FunML), the perennial “I couldn’t set up the environment” failure mode is eliminated. Reusable pipeline: the notebook-to-module tooling and PDF/PPT ingestion mean new lessons are authored once and rendered interactive, which is what makes cross-course and cross-discipline expansion tractable rather than heroic. And a progress dashboard plus an in-platform feedback panel close the loop between learners and developers.

The instructors view the two fronts as one demonstration: interactive, visualization-first AI instruction scales, from a campus member’s first encounter with regression to a graduate student stepping through uncertainty quantification — when the content pipeline, the compute, and the course are designed together.

Lessons

- **Lesson 1: Visualization before formalism.** Opening every lesson with a graphical motivation of the concept and its salient parameters, before the mathematics, is what makes the material land for learners across technical backgrounds, and it is equally effective for graduate students meeting uncertainty quantification for the first time. The interaction is the explanation: dragging the decision boundary teaches what no static figure can. We would repeat this everywhere.
- **Lesson 2: Remove the environment barrier, and keep it removed.** Running platform lessons on PACE compute and FunML demos entirely in the browser eliminated the failure mode that quietly defeats most interactive tutorials: environment setup. Anyone replicating this should solve zero-install access first, not last, the pedagogy only works if the demo opens instantly for everyone.
- **Lesson 3: Embed the demos inside the lesson, not beside it.** FunML’s design places each interactive notebook directly in the lecture page at the point where the concept appears, with the demo catalog as a secondary index. Proximity matters: a demo one click away inside the argument gets used; a demo on a separate site does not. Treat interactives as figures, part of the text, rather than as supplementary material.
- **Lesson 4: Build the content pipeline for reuse from day one.** The decision to author lessons as Python notebooks and mechanically transform them into interactive modules, plus ingestion tools that convert existing PDFs and slide decks, is what allows one small team to serve courses from first-year AI literacy to graduate machine learning. If we were starting over, we would design that pipeline before writing the first lesson, because the pipeline, not any single demo, is the scaling mechanism.