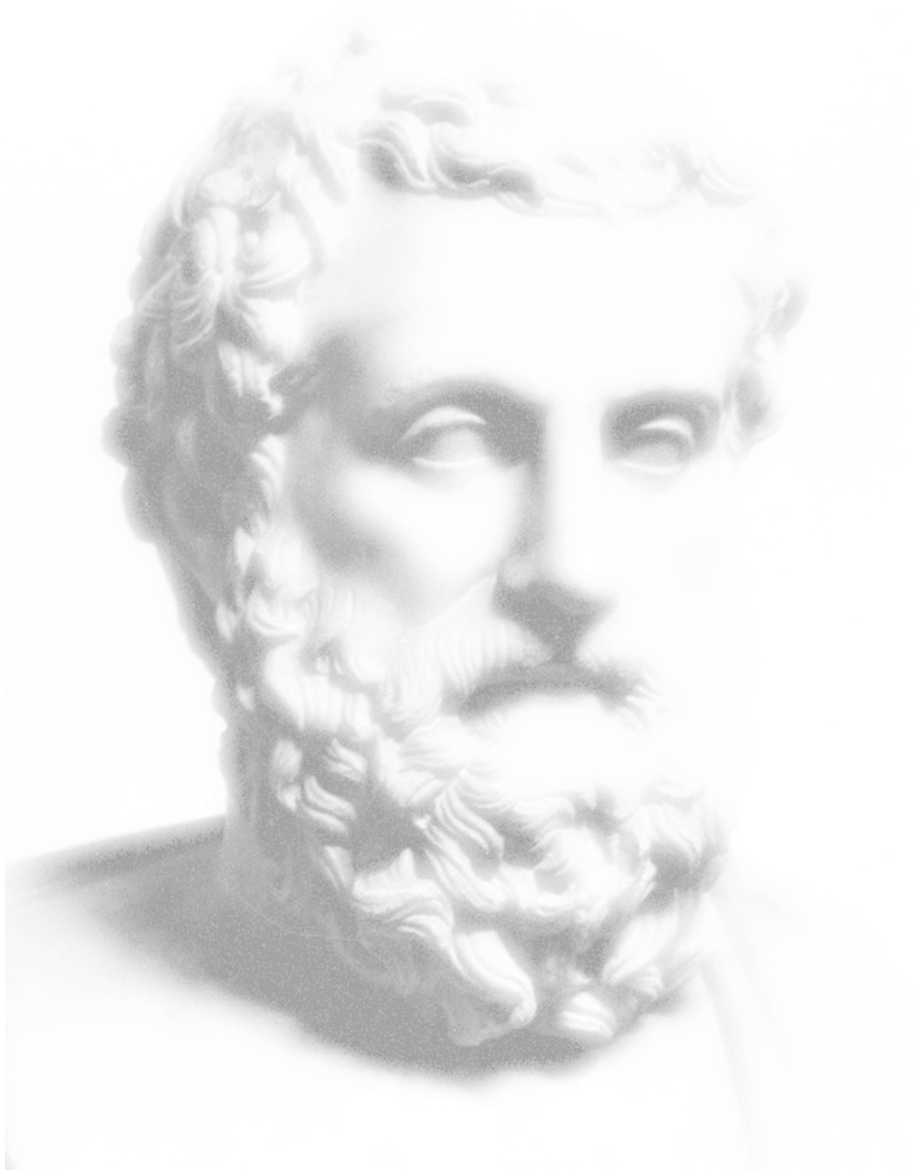


Teaching with Neurodivergentse Students

Michel Zam

KarmicSoft
Decide for your own future

Dauphine | PSL
UNIVERSITÉ PARIS

michel.zam

Ph.D CS
M.Sc. CS
M.Sc. Mech Eng

LightCode: Py
MyDraft.org
Asm C++ Java OO

Architecture, Evolution
MetaModels, MOPs

Corporate Coach
Agile, Craft
Teams of teams

EdTech
Greater good
KarmicSoft

Customize Your Class for Anyone:
An AI-Aristotelian Gamified Approach to Embrace Neurodiversity

ISLANDS of Brilliance

SIGCSE

Technical Symposium 2025

🗽**Goal**: engage gamified learning 🎓 🎯 **Today**: 🙏 🗣️ 📣 🏆

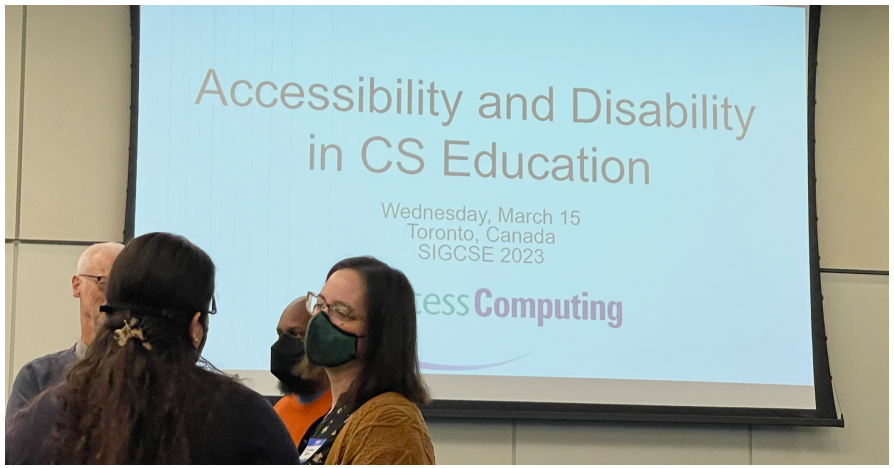
Co-funded by the European Union

UNIVERSITY of WISCONSIN UWMILWAUKEE LUBAR COLLEGE OF BUSINESS

UWM LUBAR ENTREPRENEURSHIP CENTER

NSF I-CORPS CORPS NSF Innovation Corps NSF I-CORPS HUB GREAT LAKES REGION

The story



🙏 SIGCSE'23 & Toronto

🤦🏻 Caring community

🧀 What if: sustainable *niche* 4 ND learners?

🪐 How universal this could be ND ↔️ NT?

📱 ⏱️ Attention span 💬 Texting: brb 👍 #tags

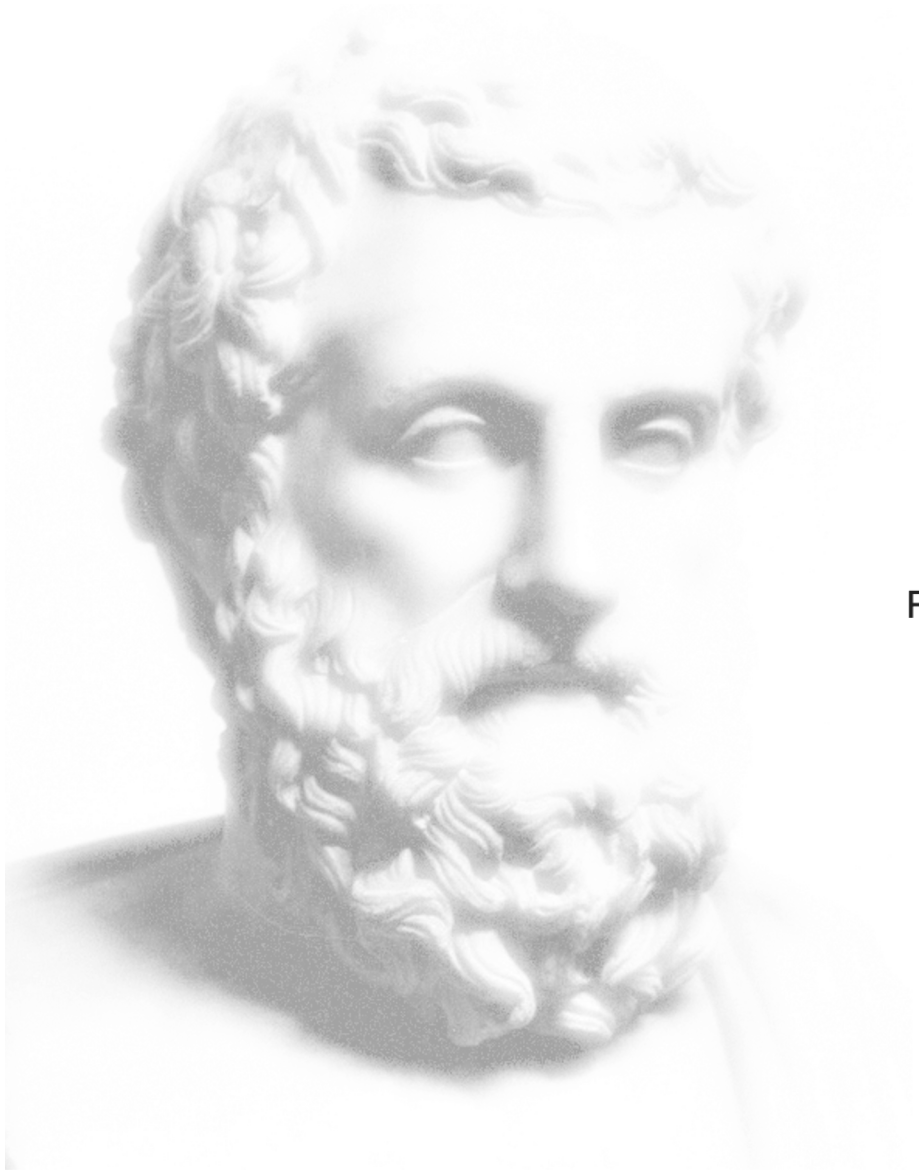
We learned more about ND & … ourselves

Environment Matters

Curricular Design Matters

Responsiveness Matters

Traits, challenges & superpowers. And 3 things that matters.



Inspired by classical drama 🎭

🏟️ Unity of place

Design & run your app in a single process: models@run.time

▶️ Unity of action

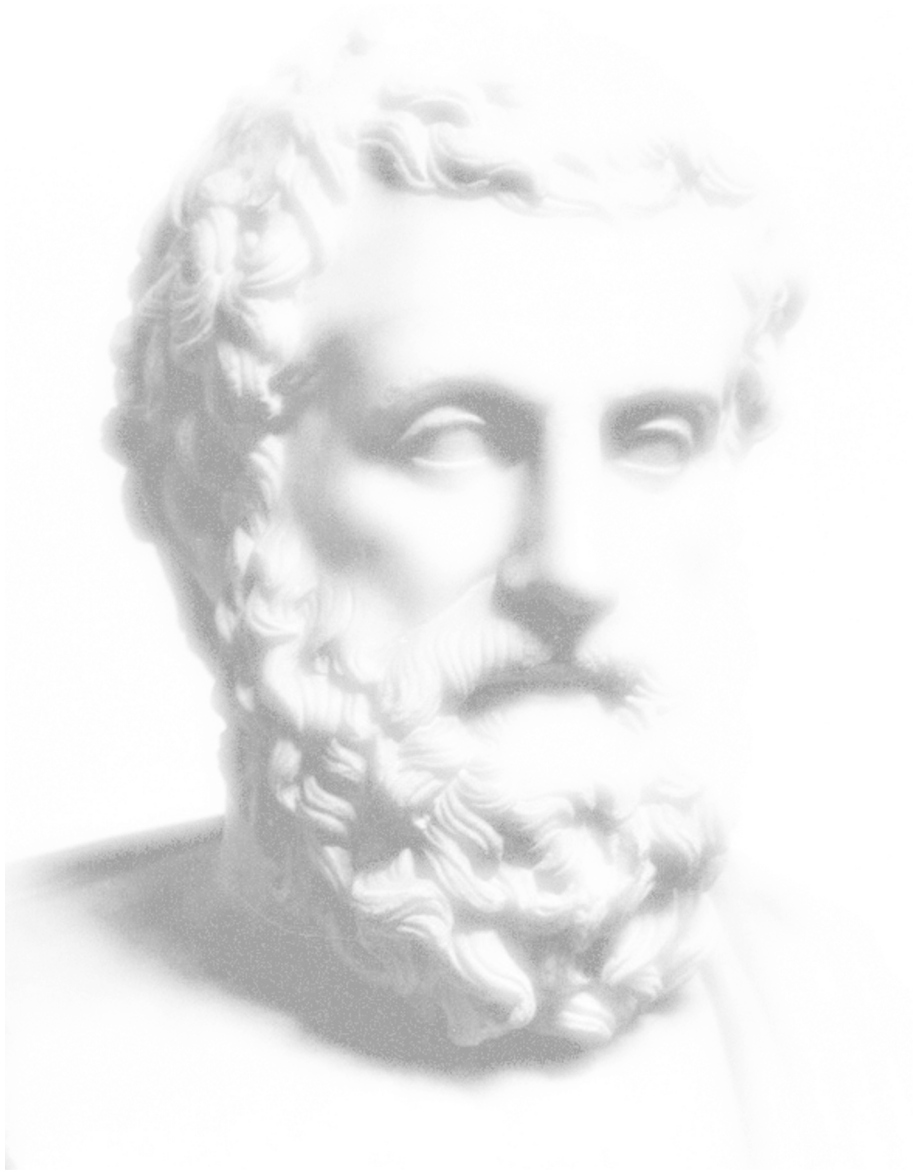
Focus on one consistent and meaningful feature, from start to end

#concept_to_teach

🕗 Unity of time

Run, design or code in 1-minute learning feedback loops

Environment Matters
Curricular Design Matters
Responsiveness Matters



```java
class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World!");
    }
}
```

```
javac HelloWorld.java
java HelloWorld
```

```
Hello, World!
```

#1time #3places #15features

```
>>> print("Hello world")
Hello world
```

#1time #1place #2features

```
>>> "Hello world"
'Hello world'                #1feature => print_text
>>> print("Hello world")
Hello world                  #1feature  => function_call
```

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Episode 1️⃣ — Meet Timmy & Ari

This is `Timmy` and his new friend. They play with pets and **functions**. You can join them too.

🖐️ Hi

🎓 Hi, I'm `Timmy` . I ❤️ pets 🐶🐱

I wanna make them games so they can play when I'm not around.

I wanna try it by myself before I'll ask for help.

😵 `Timmy` struggles

🎓 Now I'm stuck with **functions** 🪲

They look too complicated and so abstract 😵

Please help me 🙏

▶️ Help me

👩‍🏫 Meet `Ari`

🧭 Hi, I'm `Ari` . Your AI mentor. I'm a bit old, but I'm still learning 📚

Let's learn how games work, how they **function**.

Ready?

🕹️ Functions

🧭 All right. Let's play a song about **functions**.

```
"Lucky, fetch!" you call with glee,
Back he comes, ⚾ in teeth, happy as
So push the button with function's na
It returns a result, just like a ⚾ i
```

Image > Text, or letter components. Outside->In. Spin: pets

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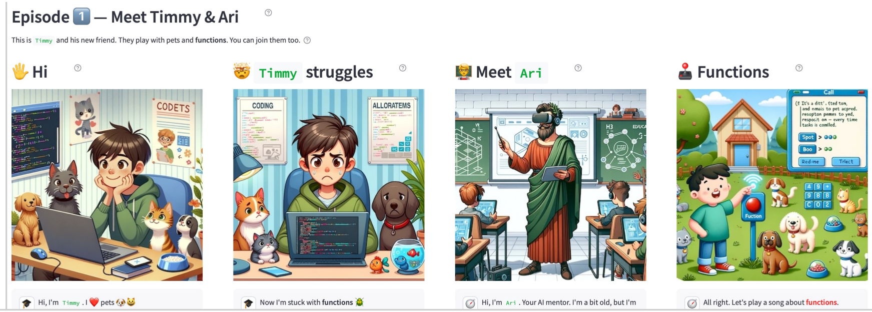

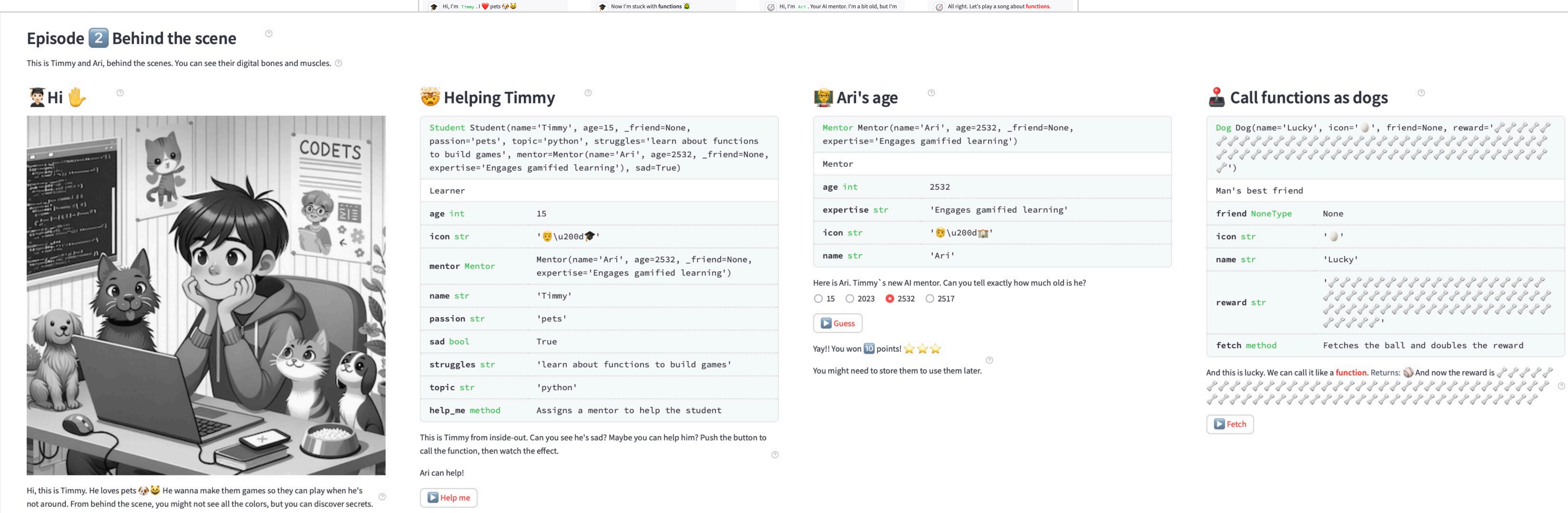

Mental model != experience => learning occurs

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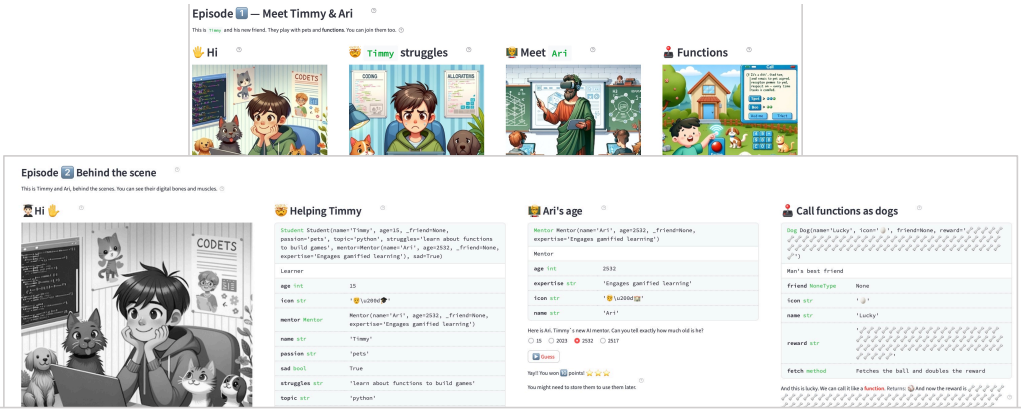


Episode 3 — Moods & behaviors

What if the whole story was build from bottom-up, outside-in and from the future? You can start by exploring, take challenges, collect rewards. Then you can sketch a solution and let your app proce the goal.

❤️ Timmy's moods

💞 **States** are heartbeats regulating Timmy's mood

🗺️ **State machine diagrams** map **behaviours** to states

🤦 Behavior

🏗️ Behaviour is implemented with **functions**

```
def help_me(self):
  self.mentor = self.friend
  self.sad = self.mentor is None
```

🐓 Models & magics

↘️ Outside-in

🖥️ To make it more accessible, we start with the screen. 🧩 Under the hood, we discover key parts.

📋 Requirements

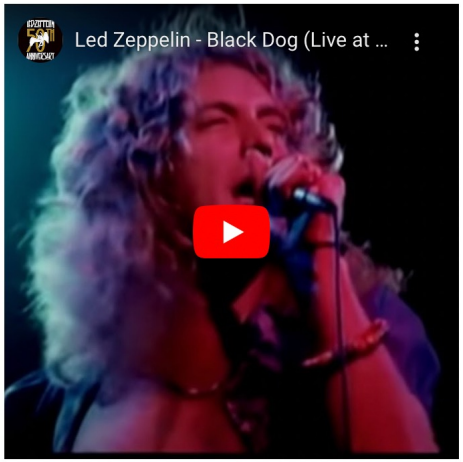
```
Feature: Timmy and Ari
  As a learner
  I want to learn about functions
  So I can build games for my pets

Scenario: Timmy needs help
    Given Timmy struggles and is sad
    When his mentor helps
    Then Timmy learns to call a function
    And his pet receives a reward
    And he becomes confident
```

🤷 Requirements can be written in plain English and even generated from your interaction with the app.

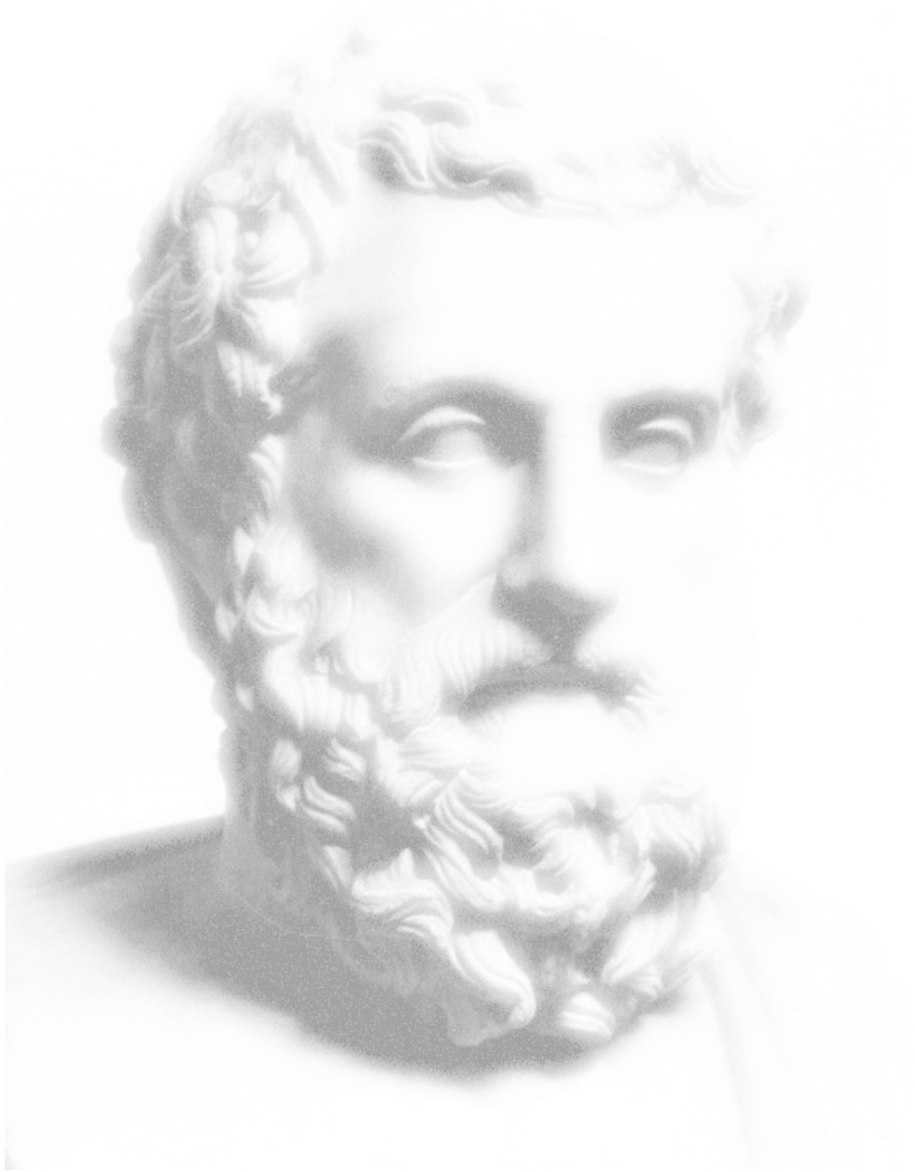
🔙 From the future

More about From the future

🎵 Celebrating song



Calling a function is as easy and memorable as: ?? clicking a button, calling a dog or playing a song. Enjoy!



Inspired by classical drama 🎭?

🏟️ Unity of place

Design & run your app in a single process: models@run.time

⬆️ *Bottom-up:* Instances *before* models & metamodels

Example: introduce Timmy & Ari **before** Person & Mentor and way before *class* & *inheritance.*

▶️ Unity of action

Focus on one consistent and meaningful feature, from start to end

↙️ *Outside-in:* Interactive behavior *before* inner design

Example: play with Timmy & Lucky like an end-user **before** you discover design & code.

🕗 Unity of time

Run, design or code in 1-minute learning feedback loops

⬅️ *From the future:* Build the app *before* specs & model

Example: play with your evolutionary app. When ready, generate evidence-driven specs.
Harvest knowledge from your own personal experience & memorable interaction.

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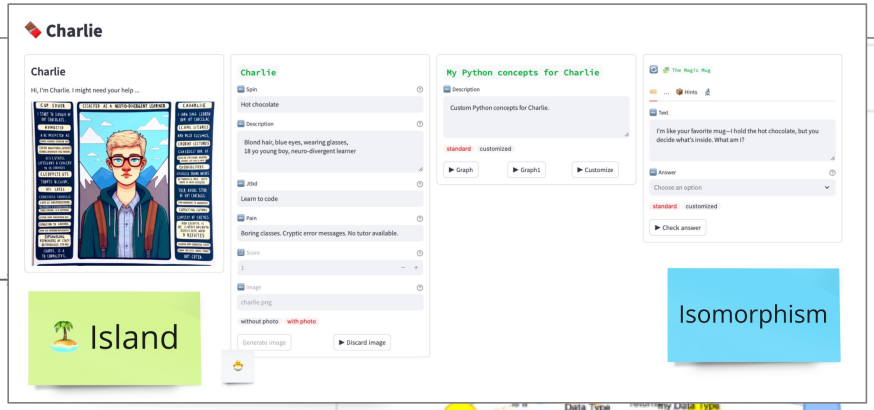
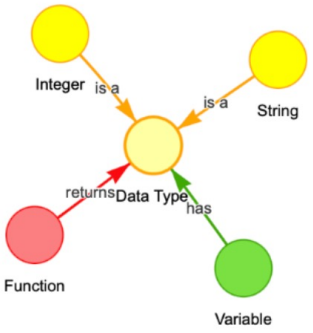
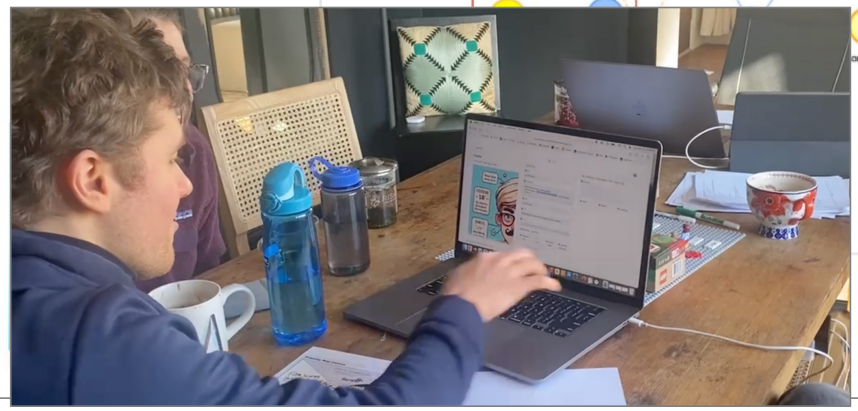
Deep, Intrinsic Interests (Spins)



Comment





Garrett II

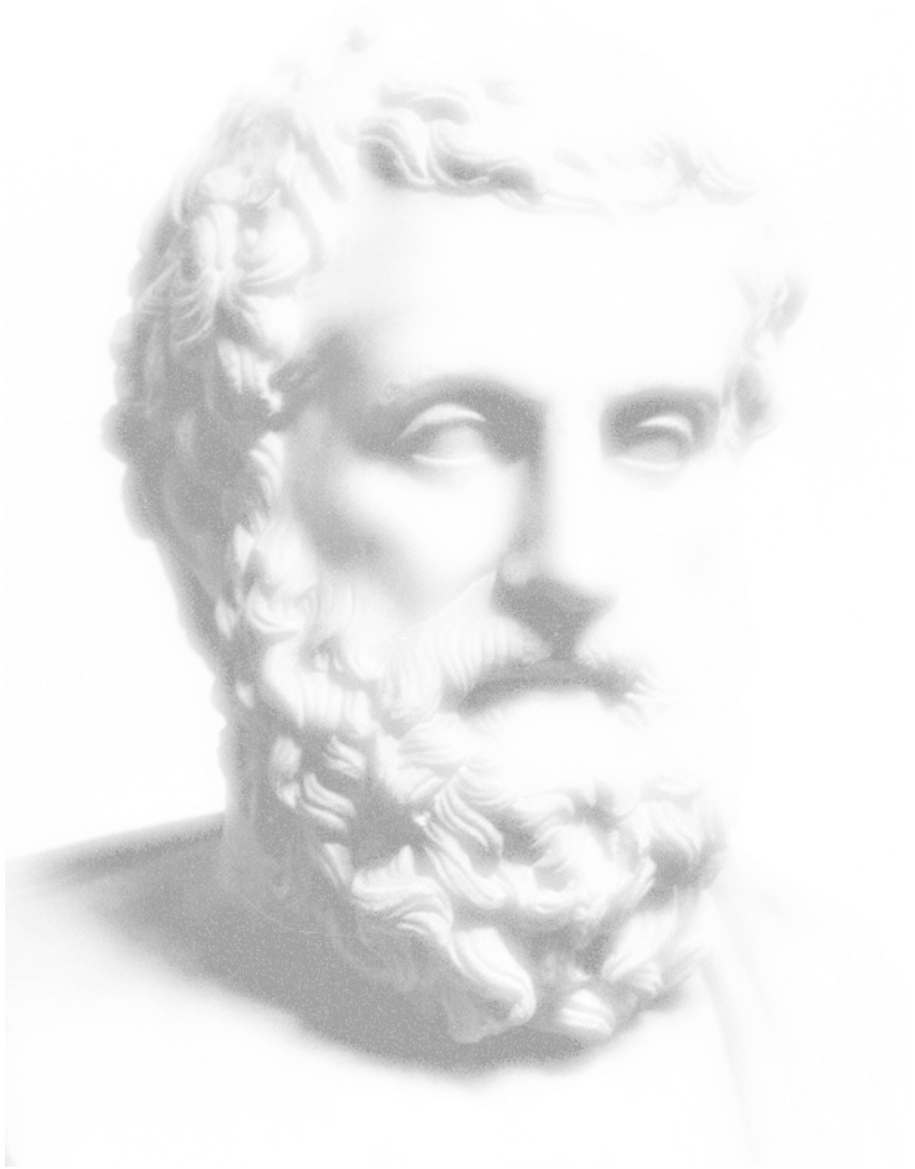
Nathan I, soon 🎓🎓

💬 From **Garrett** to people who care

🏆 **Call 4 challenge**

😩 What CS topic, hard to grasp for your students, do you want to explore?

🪐 How **Universal** is all this?



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Thank you!

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Call: customize / hack your CS Topic

SIGCSE TS 2025 (series) / Tutorials /

Tutorial 402: Customize Your Class for Anyone: An AI-Aristotelian Gamified Approach to Embrace Neurodiversity


Michel Zam
Paris-Dauphine University & KarmicSoft
France


Tara Bogart
KarmicSoft
United States


Kate Siekman
Director of Learning and Outcomes at Islands of Brilliance
United States

2

Open to collaborations: cohorts of SpINs, tests, grants …

You can apply for mini-grant

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