

mini-DREAM Challenge: Welcome & Overview

James Eddy

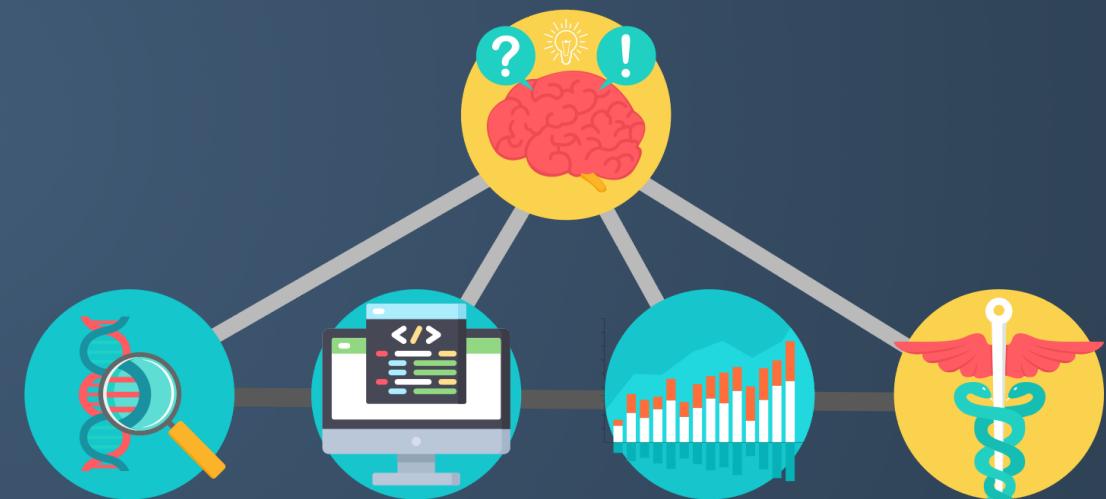
June 5, 2018

The 2018 mini-DREAM Challenge



Why are you here?

- To complement your research projects with the **CSBC/PS-ON Summer Research Program...**
- Our goals for the **mini-DREAM Challenge** are to:
 - Introduce you to **data analysis** and **basic model building**
 - Educate you on **cancer** and some specific biology related to breast cancer, motility, and metastasis
 - Guide you through realistic analysis activities to solve problems



But what's a “challenge”?

- Crowd-sourced data challenges (e.g., Kaggle): participants submit their own attempts to answer complex questions from a common dataset

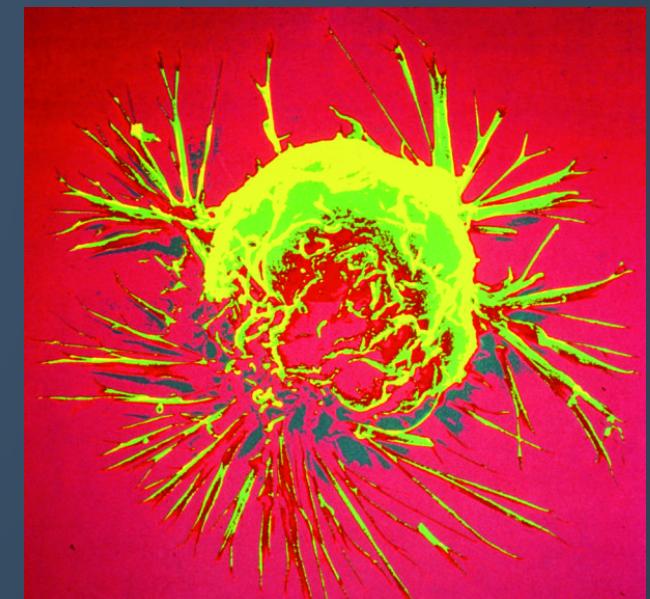


- **DREAM Challenges** ([website](#)): focused on biomedical datasets and questions, with the goal of improving ability to understand and predict disease outcomes
- Open, incentivized competitions through DREAM have led to important insights and benchmarks

Breast Cancer Prognosis DREAM Challenge

(an example)

- Goal: assess accuracy of computational models designed to predict **breast cancer survival** based on clinical information as well as genome-wide molecular measurement data
- Solutions improved over duration of the challenge; results and lessons from challenge published in 2013:
 - Margolin, et al. *Science Translational Medicine*
 - Cheng, et al. *Science Translational Medicine*



[More info here](#)

CSBC/PS-ON mini-DREAM Challenge

2018 Edition

- Similar data and questions to the original Breast Cancer Prognosis DREAM Challenge — looking at motility and metastasis
- **You** will work with real data and step through the process of building models to better understand cancer metastasis
- Module lectures will cover basics of concepts related to computational modeling and breast cancer

Course Roadmap

Challenge topics

What to expect (see **Challenge Modules**, **Challenge Timelines** pages):

- **Module 0:** Cancer biology overview and activity environment orientation
- **Module 1:** Programming and modeling for life sciences
- **Module 2:** Exploring relationships among biological variables & observations
- **Module 3:** Understanding data in reduced dimensions
- **Module 4:** Integrating biological domain knowledge
- **Module 5:** Predictive modeling for cancer prognosis
- **Module 6:** Computational modeling of biophysical processes
- **Module 7:** Informing cell models with genomics analysis

If this doesn't make sense to you right now, that's OK!

Module activities

- Each module includes a hands-on programming activity in **R** or **Matlab**. We'll use a shared cloud workspace — no installation required!



- As part of activities, you'll submit your own answers as part of a mini-DREAM Challenge exercise
- Results show up on scoreboards, but this **isn't a competition!** Scoreboards are a way for us to provide feedback.

Coding for the mini-DREAM Challenge

- ***No prior programming knowledge required!***
- Most mini-DREAM activities will provide code you can point and click; you'll be prompted to write some on your own, but we'll help!
- Goal is to show you what code does and how it can help you, not teach you how to program (which could take an entire summer by itself)
- **Know how to code already?** Real emphasis of the course is on working with and analyzing data — hopefully plenty of new, cool stuff for everyone. If you want to learn more or go beyond module activities, talk to us!

Beyond mini-DREAM

What to do after this course?

- Learn more about programming, data science, and computational biology! (lots of free resources online — and we'll try to add links to more of these on the Synapse site)
- Use these approaches in your own research!
- Participate in a real DREAM Challenge

Navigating the mini-DREAM Synapse site

Important locations

Some notes on how to find things...

The screenshot shows a web browser window titled "2018 CSBC PS-ON mini-DREAM Challenge". The URL is https://www.synapse.org/#!Synapse:syn12105406/wiki/. The browser's toolbar includes various icons for file operations, search, and bookmarking. The main content area displays the challenge details:

Synapse ID: syn12105406 **Storage Location:** Synapse Storage

Challenge Tabs: Wiki, Files, Tables, Challenge, Discussion, Docker

Challenge Overview:

- 2018 CSBC PS-ON mini-DREAM Challenge
- Getting Started
- Challenge Overview
- Challenge Modules
- Scoreboards
- Additional Resources
- Extended R

Challenge Description:

Breast Cancer Metastasis mini-DREAM Challenge
Summer 2018
Statistical & Mechanistic Modeling of Cell Line and Patient Data

ENABLED BY: CANCER SYSTEMS BIOLOGY CONSORTIUM, PHYSICAL SCIENCES IN ONCOLOGY, NIH/NCI at Frederick, SageBionetworks

Description: The CSBC/PS-ON mini-DREAM Challenge is an 8 week program designed to introduce basic concepts in programming, statistics, and cancer biology. The goal of the mini-DREAM program is for students to participate in educational modules, complete activities, ask questions, and to come away from the course with a greater awareness of what it means to apply computational approaches to biomedical problems.

Dates:
Signup Open: June 5th, 2018
Launch: June 7th, 2018
Close: July 31st, 2018

Participants: Number of Registered Participants: 18
Click [here](#) to see where in the world solvers are coming from.

Important locations – Getting started

The screenshot shows a web browser window with the title bar "2018 CSBC PS-ON mini-DREAM X". The address bar displays "Secure | https://www.synapse.org/#!Synapse:syn12105406/wiki/". The page content is for the "2018 CSBC PS-ON mini-DREAM Challenge". The main header features a star icon and the text "2018 CSBC PS-ON mini-DREAM Challenge". Below the header, there's a sidebar with links: "Getting Started" (which is highlighted with a black arrow pointing to it), "Challenge Overview", "Challenge Modules", "Scoreboards", "Additional Resources", and "Extended R". The main content area has a banner for "Breast Cancer Metastasis" with the text "Summer 2018 Statistical & Mechanistic Modeling Cell Line and Patient Data". A large button in the center says "Getting Started page". Below the banner, a paragraph describes the challenge as an 8-week program. It also lists the "Signup Open" date as June 5th, 2018, the "Launch" date as June 7th, 2018, and the "Close" date as July 31st, 2018. At the bottom, it shows "Number of Registered Participants: 18" and a link to "Click here to see where in the world solvers are coming from."

Important locations – Home page

The screenshot shows a web browser window for the 2018 CSBC PS-ON mini-DREAM Challenge on the Synapse platform. The URL is <https://www.synapse.org/#!Synapse:syn12105406/wiki/527868>. The page title is "2018 CSBC PS-ON mini-DREAM Challenge". A large dark blue banner at the top right says "Back to home page". Below the banner, the main content area is titled "Getting Started". It includes sections for "Step 1. Sign Up", "Step 2. Access Course Materials", and "Step 3. Share Ideas and Ask Questions". On the left, there is a sidebar with a navigation menu for the challenge. A black arrow points from the "Back to home page" button to the "Getting Started" section.

Secure | https://www.synapse.org/#!Synapse:syn12105406/wiki/527868

James Eddy (jaeddy)

2018 CSBC PS-ON mini-DREAM Challenge

Synapse ID: syn12105406

Wiki Files Tables Challenge Discussion Docker

Getting Started

2018 CSBC PS-ON mini-DREAM Challenge

Getting Started

mini-DREAM Signup

Accessing Course Materials

Share Ideas and Ask Questions

Challenge Overview

Challenge Modules

Scoreboards

Additional Resources

Extended R

Edit Order

Back to home page

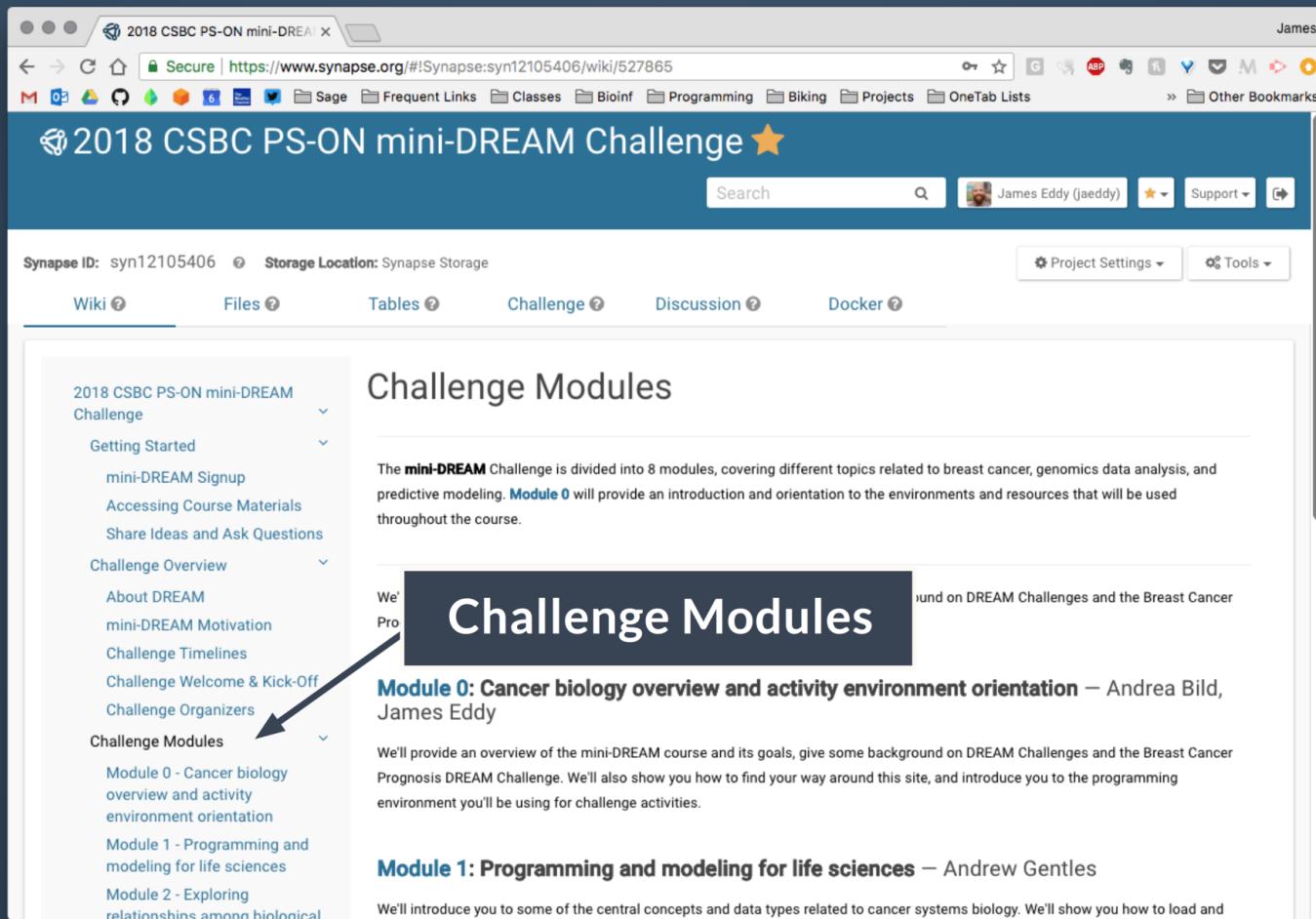
Getting Started page

Step 1. Sign Up

Step 2. Access Course Materials

Step 3. Share Ideas and Ask Questions

Important locations – Modules



The screenshot shows a web browser window with the title "2018 CSBC PS-ON mini-DREAM Challenge". The URL is <https://www.synapse.org/#!Synapse:syn12105406/wiki/527865>. The page displays the "Challenge Modules" section, which is divided into 8 modules: Module 0, Module 1, Module 2, Module 3, Module 4, Module 5, Module 6, and Module 7. Each module has a brief description and a link to its details. The sidebar on the left also lists other challenge-related sections like "Getting Started", "Challenge Overview", and "Challenge Organizers". A red arrow points from the "Challenge Modules" section in the sidebar to the main content area.

2018 CSBC PS-ON mini-DREAM Challenge

Synapse ID: syn12105406 Storage Location: Synapse Storage

Wiki Files Tables Challenge Discussion Docker

Project Settings Tools

Challenge Modules

The mini-DREAM Challenge is divided into 8 modules, covering different topics related to breast cancer, genomics data analysis, and predictive modeling. [Module 0](#) will provide an introduction and orientation to the environments and resources that will be used throughout the course.

Challenge Modules

We're Profound on DREAM Challenges and the Breast Cancer

Module 0: Cancer biology overview and activity environment orientation — Andrea Bild, James Eddy

We'll provide an overview of the mini-DREAM course and its goals, give some background on DREAM Challenges and the Breast Cancer Prognosis DREAM Challenge. We'll also show you how to find your way around this site, and introduce you to the programming environment you'll be using for challenge activities.

Module 1: Programming and modeling for life sciences — Andrew Gentleman

We'll introduce you to some of the central concepts and data types related to cancer systems biology. We'll show you how to load and

Important locations – Background

The screenshot shows a web browser window with the title "2018 CSBC PS-ON mini-DREAM Challenge". The URL in the address bar is <https://www.synapse.org/#!Synapse:syn12105406/wiki/527866>. The page content is titled "Challenge Overview". A large, semi-transparent black box covers the right side of the page, containing the text "Challenge Overview page". An arrow points from the left margin towards this box. On the left, there is a sidebar with a navigation menu:

- 2018 CSBC PS-ON mini-DREAM Challenge
 - Getting Started
 - mini-DREAM Signup
 - Accessing Course Materials
 - Share Ideas and Ask Questions
 - Challenge Overview
 - About DREAM
 - mini-DREAM Motivation
 - Challenge Timelines
 - Challenge Welcome & Kick-Off
 - Challenge Organizers
 - Challenge Modules
 - Module 0 - Cancer biology overview and activity environment orientation
 - Module 1 - Programming and modeling for life sciences
 - Module 2 - Exploring relationships among biological

Other important locations

- Discussion boards — read, post, and answer questions
- Scoreboards — more on this later...
- Additional resources — other links to supplement module topics

What next?

Module 0

- **Cancer biology overview and activity environment orientation**
 - Introduction to breast cancer [presentation]
 - Introduction to R Markdown & R Notebooks [activity]
- If you haven't already...
 - Sign up for a Synapse account
 - **Join the 2018 Summer mini-DREAM team**
 - Explore the mini-DREAM site (<https://www.synapse.org/miniDREAM2018>)

Thanks!!

We look forward to working with you!