T4CT DESIGN CHALLENGE

2-Day Engineering Hackathon

June 23–24, 2026 · McCourtney Hall, University of Notre Dame

Team Lead Discussion Guide

Challenge Overview

Each team will tackle a real-world bioimage analysis problem using provided datasets and computational tools. The mission: develop, test, and deploy an AI/ML-based analysis pipeline that extracts meaningful biological insights from complex imaging data.

Deliverable: A 10-minute presentation on Thursday, June 25 showcasing:

- The biological question you addressed
- Your technical approach and tools used
- Key results and visualizations
- Engineering challenges overcome and potential solutions for automated analysis of similar data sets
- Future directions and impact

Team Structure & Datasets

Seven teams, five dataset tracks. Two datasets are shared across paired teams.

Team	Dataset	Challenge Goal
Teams 1 & 2	Drosophila wing disc (3D confocal) and Drosophila wing disc Ca2+ imaging	Cell and tissue segmentation + area distribution analysis and spatiotemporal analysis of calcium signaling events in a growing organ
Team 3	TIRF actin filaments	Actin filament organization & architecture quantification
Team 4	Zebrafish embryo (light sheet)	Cell segmentation + Ca^{2+} signal tracking
Teams 5 & 6	Organoid (3D widefield) and 2D cell migration	Lumen volume & aspect ratio measurements, cell migration speed and distribution of signaling events as function from boundary
Team 7	Neuron and/or astrocyte Ca^{2+} imaging (2-photon)	Denoising, ROI segmentation, signal extraction

Hackathon Timeline & Milestones

DAY 1 — Tuesday, June 23

9:00 AM Kickoff & Team Formation

- Welcome, challenge overview, logistics
- Team introductions & role assignments
- Dataset access and initial exploration

10:00 AM Milestone 1: Problem Definition & Strategy

- Define specific biological question
- Identify key metrics to extract
- Select preliminary tools/approaches
- **Checkpoint: 5-minute team presentations on problem definition and approach**

12:00 PM Lunch Break - CATERED LUNCH

1:00 PM Work Session 1: Data Exploration & Prototyping

- Load and visualize datasets
- Test preprocessing steps (denoising, normalization)
- Begin building analysis pipeline

3:30 PM Milestone 2: Pipeline Prototype

- Working code that processes sample images
- Initial segmentation/detection results
- Identified technical challenges
- **Checkpoint: Demo prototype to facilitators (5 min/team)**

5:30 PM Day 1 Wrap-up

- Team reflections and planning for Day 2
- Troubleshooting session with faculty leads
- Optional: Team dinners (self-organized)

DINNER ON YOUR OWN: TEAMS ARE ENCOURAGED TO GO TO DINNER TOGETHER

DAY 2 — Wednesday, June 24

9:00 AM Work Session 2: Refinement & Validation

- Optimize pipeline parameters
- Process full dataset
- Generate quantitative results

11:00 AM Milestone 3: Results & Visualization

- Finalized quantitative analysis
- Publication-quality figures
- Statistical validation of results
- **Checkpoint: Show key figures to team lead (15 min/team)**

12:30 PM Lunch Break - CATERED LUNCH

1:30 PM **Work Session 3: Presentation Prep**

- Synthesize results into narrative
- Create presentation slides
- Rehearse timing and transitions
- Address remaining technical issues

3:30 PM **Milestone 4: Dry Run Presentations**

- Each team presents to 1–2 other teams (8 min + 2 min feedback)
- Peer feedback on clarity, technical depth, and storytelling

5:00 PM **Final Refinements**

- Incorporate feedback
- Finalize slides and demo

6:00 PM **Day 2 Wrap-up**

- Presentations
- **Team dinner (Pizza party) and informal social networking**
    - Team presentations to faculty and attendees
    - 10 minutes per team (7 min presentation + 3 min Q&A)
    - Judging by faculty panel TBD for Best Presentation

Team Lead Discussion Points

Items to align on before kickoff.

Roles & coverage

- Confirm a faculty lead / facilitator assigned to each of the 7 teams.
- Who runs each checkpoint (Milestones 1–4) and how feedback is captured.
- Coverage for paired-team datasets (Teams 1 & 2; Teams 5 & 6) — same lead or separate?

Datasets & tooling readiness

- Verify all 5 datasets are accessible and staged before 9:00 AM Day 1.
- Confirm compute environment, software, and example pipelines per track.
- Identify expected technical pitfalls per dataset and prepare quick-reference guidance.

Logistics

- Rooms, power, networking, and presentation/AV setup for all three days.
- Meals: lunches both days, Day 2 team dinner.
- Submission mechanism and deadline for presentation files (end of Day 2).

Judging & awards

- Confirm faculty judging panel and scoring rubric for the 7 min + 3 min Q&A format.
- Align rubric with the 5 required deliverable components (question, approach, results, challenges, impact).
- Confirm award structure: Best Poster Awards — $300 / $200 / $100.

Open questions to resolve

- Are presentation files due end of Day 2 or morning of Day 3? (Timeline lists submission at Day 2 wrap-up.)
- Final team rosters and any cross-team dependencies.