



Quad Chart Template

Quad Chart Title:

- In the upper right-hand corner, list the project ID
- Line one is the title of your project
- Line two is your name, school, and country

Quadrant 1: Research Question

- State the research question or engineering problem being addressed. You may use images or bulleted list

Quadrant 2: Methodology/Project Design

- Provide a succinct, bulleted summary of the methodology/project design. You may use images.

Quadrant 3: Data Analysis & Results

- Provide a succinct, bulleted summary of results
- It is advised that this quadrant should be primarily be a graphic representation of relevant data and results

Quadrant 4: Interpretation & Conclusions

- Provide a succinct, bulleted summary of conclusions

Quad chart must be only one page.

Make sure to save the document as PDF before uploading into application system.

Submission of this document for science projects is optional but highly recommended.

Here is a Quad Chart example from the [ISEF 2021 Finalist and 1st Place Grand Award Winner in Microbiology - Neha Mani](#)

A Diagnostic Method for Intestinal Disease

Neha Mani, Hunter College High School, New York, New York, USA

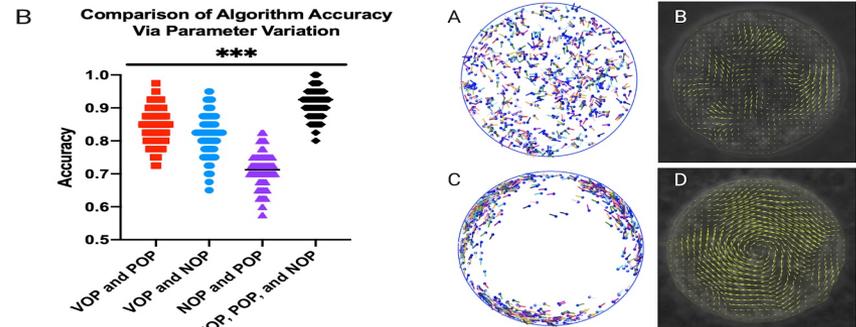
Q1: Research Question

SWARMING VS. SWIMMING

Motility Type	Collectivity	Dimensionality	Order	Physiological Role
swarming	moves in groups 	2-D motion	collective, dynamic	virulent or result of inflammation, associated with pathogenesis (present in SM3 for IBD)
swimming	individualized 	3-D motion	chaotic	commensal, associated with homeostasis (absent in SM3 for IBD)

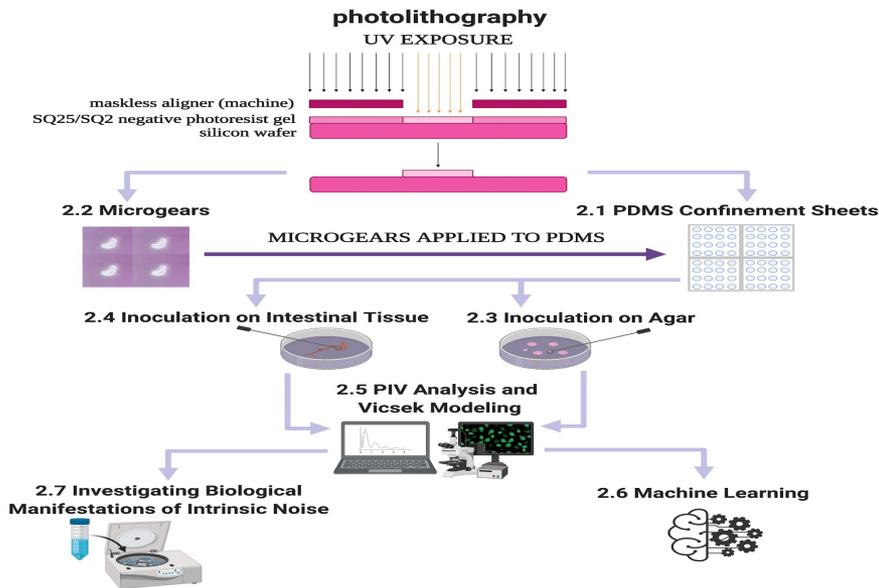
- How can bacterial motility be quantified and distinguished for application in the diagnosis of Inflammatory Bowel Disease?

Q3: Data Analysis & Results



- Swarming manifested in high VOPs and swimming manifested in low VOPs.
- Machine learning algorithm with VOP, POP, and NOP has 91% accuracy.

Q2: Methodology



Q4: Interpretation & Conclusions

STANDARD VS. EXPERIMENTAL DIAGNOSTIC PROTOCOL

Protocol	Cost (without insurance)	Time	Risk	Accuracy/Positivity Rate
Standard (blood tests, fecal tests, colonoscopy)	CBC/metabolic panel blood tests: ~ \$500-\$1100 fecal tests: ~ \$200 per test colonoscopy without polypectomy: ~ \$800	blood tests: 1-3 days fecal tests: 7-14 days colonoscopy results: immediate (if outright negative) to 10 days	blood and fecal tests: no risk colonoscopy: 0.25% risk of bowel perforation, burns, and bleeding (Zauber, 2014).	biomarker positivity rate in blood tests: 1.4% to 71% fecal tests: 48% to 89%
Experimental (use of stool sample and microchip)	Cost of PDMS chip + petri dish setup + analysis methods: ~ \$50 per test	6 - 12 hours	use of stool sample: no risk	algorithm with VOP, POP, and NOP yields 91% accuracy

- Swarming is defined by uniformity with high VOPs; swimming is defined by disarray with low VOPs.
- Intrinsic noise and alignment force seem to be major variables separating motility mathematically.
- This novel tool has clinical promise due to its higher specificity and accuracy than current diagnostic methods.

Science Project Title
Student Name, School, Country

Project ID

Q1: Research Question

Q3: Data Analysis & Results

Q2: Methodology/Project Design

Q4: Interpretation & Conclusions