The GAME Worksheet

Computational modelling mini-project

Student name: _____ **Date:** _____
Dissertation title: _____
Dataset / task: _____

G — Goals

Define & ground your objective (what problem is being solved, and why?)

1) Scientific core question (1–2 sentences)

> What are you trying to explain, predict, or optimise?

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2) Inputs, outputs, and constraints (bullet points)

- **Inputs (what the model "sees"):** _____
- **Outputs (what the model predicts/produces):** _____
- **Key constraints (e.g., limited information, time pressure, noise):** _____

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3) Normative objective (plain English + optional equation)

Plain English: (e.g., maximise reward, minimise error, stay within a band, etc.)

Optional formal statement (if you can):

- Cost / utility / loss: _____
- Variables in the objective (define them briefly): _____

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4) Philosophical / theoretical commitments (tick + specify)

☐ Dynamical systems
☐ Predictive processing / inference-based
☐ Control / regulation (set-points, homeostasis)
☐ Reinforcement learning
☐ Other: _____

One sentence on how this commitment shapes your objective:

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5) Empirical seeding (where do initial parameter values come from?)

- Dataset(s) or prior literature used to choose defaults: _____
- What did you "seed" from data (e.g., noise level, reward rates, priors)? _____

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6) Intervention-ready "knobs" (parameters you can tune)

List parameters you will vary, and what they mean in everyday language:

Parameter ("knob")	What it controls (plain English)	Range you will test

7) Stakeholders / context (optional, if relevant)

Who would care about this model and why? _____

Applied outcome metric (if any): _____

A — Algorithms

Mechanistic instantiation (how does the model actually work?)

1) Representations (what is stored internally?)

Examples: value estimates, beliefs, latent state, internal "meter", memory traces, etc.

- Internal variables / states: _____

- What each represents (plain English): _____

2) Update rules (write the simplest version you can)

Learning / update rule(s):

- Rule 1 (words):
  _____
- Rule 1 (equation, optional): _____

Decision / choice rule(s):

- Rule 2 (words):
  _____
- Rule 2 (equation, optional): _____

3) Candidate models to compare (Model 1 vs Model 2)

Model 1 name: _____ **Core idea (1 line):** _____
Model 2 name: _____ **Core idea (1 line):** _____

What differs between them (mechanism or objective)?

_____

4) Simulation plan ("what-if" sweeps)

- What parameter(s) will you sweep first? _____
- What plots/signatures will you generate from simulations? _____

5) Reproducible workflow (Colab + GitHub plan)

- GitHub repo name/link: _____
- Colab "open notebook" link: _____
- Files you will include (tick):
  ☐ notebook(s) ☐ `src/` code ☐ requirements ☐ README ☐ outputs folder
- Random seed(s) used:
  _____

M — Measurements

Empirical validation + goodness of fit (how do you test the model against data?)

1) Data source (online dataset details)

- Dataset name + link: _____
- What variables will you use (choices, rewards, RT, etc.)? _____

2) Quantitative predictions (what will the model predict?)

Tick what you will predict and write a specific prediction.

☐ Choice probabilities
☐ Switching rate / exploration pattern
☐ Reaction times
☐ Other: _____

Specific predicted pattern (1–2 lines):

3) Fit method (how will you estimate parameters?)

☐ MLE / MAP (optimisation)
☐ Bayesian sampling (optional)
☐ Grid search (simple/robust for demos)

What parameters are fitted? _____
What parameters are fixed, and why? _____

4) Goodness-of-fit & model comparison metrics

Tick what you will report:

☐ Log-likelihood / negative log-likelihood
☐ AIC
☐ BIC
☐ Cross-validated predictive log-likelihood (recommended)
☐ Posterior predictive / simulation check
☐ R^2 (only if you're fitting continuous outcomes)

Your chosen primary metric (one): _____
Your secondary metric(s): _____

5) Model check plots (minimum 2)

Plot 1: _____ What should it show? _____
Plot 2: _____ What should it show? _____

E — Evolution

Iterate, refine, integrate — noting limitations

1) Decision rule (what makes you revise the model?)

Examples: "Model 2 must improve CV log-likelihood by X", "BIC must be lower", etc.

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2) If the model fits poorly, what will you change first?

☐ Change parameter ranges / priors
☐ Change the objective (cost/utility function)
☐ Change the mechanism (update rule / representation)
☐ Simplify (remove parameters)
☐ Add realism (add state variable, noise, etc.)

First planned revision: _____

3) Theory coherence check (1–2 lines)

How will you ensure changes still match your original theoretical stance?

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4) Integration / translation (optional)

- Could any "knob" be tuned in real life (training/UI/etc.)? _____
- What would count as a practically meaningful improvement? _____

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5) Limitations (required)

List the biggest limitations of your demo/model test (at least 3):

1. _____
2. _____
3. _____

Submission checklist

☐ Repo has a clear README with "Run in Colab" link(s).
☐ Notebook runs top-to-bottom ("Run all") without manual fixes.
☐ Seed(s) are set and reported.
☐ You report at least **one** fit metric + **one** predictive check.
☐ You include a short "Limitations" section in E.