Week 3 Reflection – Computational Economics

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Task 1: Computational Exploration with NashPy / GTE

- **Game Introduction**

The Stag Hunt is a classic two-player coordination game that captures the tension between safety and cooperation. The two hunters, Hunter A and Hunter B, choose the strategy between hunting a stag and hunting a hare. The pay-off logic is as follows: Hunting a stag requires cooperation. If both choose Stag, each earns the highest payoff, which means each hunter gets four points. However, if one defects and hunts a hare, the stag hunter gets nothing, which is zero points. Hunting a hare is individually secure regardless of the other's choice. The hare hunter earns at least 3 points, so this strategy is safe but less rewarding.

	Player 2: Stag	Player 2: Hare
Player 1: Stag	(4, 4) *Nash equilibria*	(0, 3)
Player 1: Hare	(3, 0)	(3, 3) *Nash equilibria*

Figure 1: Pay-off matrix of Stag Hunt. Created by Microsoft Word.

References:

Skyrms, Brian. 2001. "The Stag Hunt." *Proceedings and Addresses of the American Philosophical Association* 75 (2): 31–41. https://doi.org/10.2307/3218711.

- **CoLab Link**

https://colab.research.google.com/drive/1GZ7N3ER3YR92K_cpC4gvyRu9bo1zIHoA?usp=sharing

- **Interpretation**

Using CoLab and NashPy, the result shows that the Stag Hunt game has two pure-strategy Nash equilibria: (Stag, Stag) and (Hare, Hare). These two outcomes feel very different. (Stag, Stag) reflects trust and cooperation, where both players commit and end up with the best possible pay-off. On the other hand, (Hare, Hare) is safer but less rewarding, since each player avoids the risk of being left alone with nothing. The outcome is surprising as the game highlights the difficulty of coordination. Even when cooperation is clearly better, people may still choose the cautious option unless there is trust, clear communication, or some outside institution helping them coordinate.

(Word count: 107 words)

Reference:

Battalio, Raymond, Larry Samuelson, and John Van Huyck. 2001. "Optimization Incentives and Coordination Failure in Laboratory Stag Hunt Games." *Econometrica* 69 (3): 749–764. https://www.jstor.org/stable/2692208.

Büyükboyacı, Mürüvvet. 2014. "Risk Attitudes and the Stag-Hunt Game." Economics Letters 124 (3): 323–325. https://doi.org/10.1016/j.econlet.2014.06.019.

Task 2: Existence & Complexity of Equilibria

- **Formal Definition**

"A **jungle equilibrium** for a jungle housing economy is a profile of houses

(x^i) such that:

(i) There are no two agents $i, j \in N$ for which $i \rhd j$ and x^$j \succ$^i x^i .

(ii) The profile (x^i) is in F."

(Richter and Rubinstein 2024, 17)

Paraphrase:

1. The jungle equilibrium is defined in a setting where stronger agents (according to a power ordering B) may claim assets from weaker agents.
2. Condition (i): No stronger agent prefers another's house over their own; there's no incentive or ability for a stronger agent to take a better asset from someone weaker. Condition (ii): The allocation is feasible, and every agent occupies a distinct house.
3. This definition generalizes equilibrium beyond markets and games, anchoring on power dynamics instead of prices or strategic best responses.

Reference:

Richter, Michael, and Ariel Rubinstein. 2024. *No Prices No Games! Four Economic Models.* Cambridge, MA: MIT Press.

- **Existence Theorem**

"Proposition 1.1: Existence of a Jungle Equilibrium. Every jungle housing economy has a jungle equilibrium." (Richter and Rubinstein 2024, 17)

Paraphrase:

1. This proposition states that a jungle equilibrium always exists in the defined model of a housing economy guided by power relations.
2. Demonstrated by a serial dictatorship mechanism: the strongest agent picks their favorite house first, followed by the next strongest choosing from the remainder, and so on.

3. This existence theorem ensures that even without prices or strategic games, stable power-based allocations can always be found, thus extending the applicability of equilibrium concepts.

Reference:

Richter, Michael, and Ariel Rubinstein. 2024. *No Prices No Games! Four Economic Models.* Cambridge, MA: MIT Press.

- **Computational Complexity/Traceability Statement**

"Our terminology can be used to characterize different traceability approaches... it allowed us to easily assign terms based on the short descriptions of just a few sentences."

Paraphrase:

1. The paper's terminology simplifies the comparison and contrast of different model-based traceability approaches.
2. It provides a framework to quickly characterize an approach based on the types of trace links it produces (e.g., explicit vs. implicit, intra-model vs. inter-model).
3. This reduces the conceptual complexity and ambiguity that previously made discussing and evaluating these approaches difficult ("the jungle").
4. It matters because it enables more efficient research, tool development, and practical implementation of traceability by providing a clear framework for discussion.

Reference:

Holtmann, Jörg, Jan-Philipp Steghöfer, Michael Rath, and David Schmelter. 2020. "Cutting through the Jungle: Disambiguating Model-based Traceability Terminology." In *2020 IEEE 28th International Requirements Engineering Conference (RE)*, 1–11. IEEE. https://doi.org/10.1109/RE48521.2020.00014.

- **Flowchart**

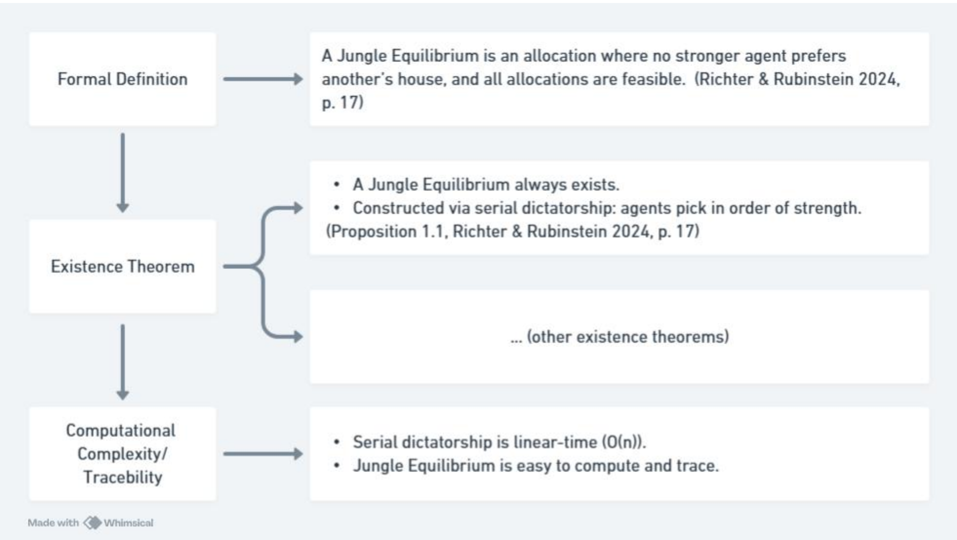

Figure 2: flowchart of the relationship between formal definition, existence theorems, and computational complexity/traceability. Created by whimscal, exported as PNG.

- **Reflection**

The Jungle Equilibrium illustrates how equilibrium can be defined without relying on prices or strategic best responses. According to Richter and Rubinstein (2024, 17), it is based on power relations: stronger agents cannot improve by seizing weaker agents' houses, and each allocation must remain feasible. The existence theorem (Proposition 1.1) shows that such an equilibrium always exists and can be constructed by the serial dictatorship mechanism, where agents choose houses in order of strength. This method not only proves existence but also provides a straightforward algorithm. Compared with the Nash equilibrium, which is often hard to compute in general settings, the Jungle Equilibrium is relatively tractable since the procedure is linear in the number of agents. From a broader perspective, tractability is not only computational but also conceptual: having clear definitions and mechanisms makes models easier to apply and compare. This connection between existence and tractability is important because it shows how equilibrium concepts can remain both rigorous and usable. It also helps me see how economic models can be designed in a way that balances theoretical depth with practical accessibility.

(Word count: 180 words)

Task 3: Global Frontier Reflection

- **Part A: Comparative Reflection**

Platforms such as AWS and Tencent are becoming essential tools for computational economics, since they make it possible to run big simulations, test markets, and process large datasets. The good side is obvious: faster research and more informed decision-making. However, there are also risks, including data privacy issues, bias in algorithms, and the fact that not everyone can access these tools equally. The U.S. model (AWS) usually focuses on scalability and open services for a wide range of users, while Tencent tends to build on its own ecosystem and use local data strengths. So, both sides have similarities in technology, but they are different in regulation and governance. From an ethical angle, these tools could help reduce inequality (SDG 10) and improve accountability (SDG 16), but only if innovation goes hand in hand with fairness and oversight.

(Word count: 137 words)

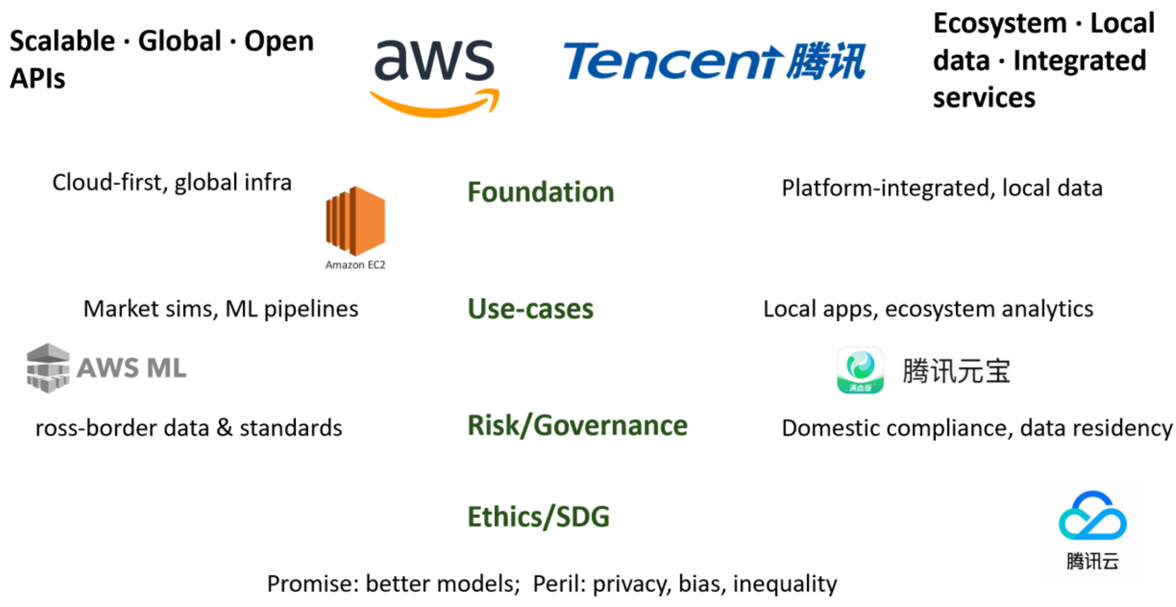

Figure 3: AWS vs Tencent platform relevant to computational economics. Created by Microsoft PowerPoint, exported as PNG.

- **Part B: Liberal Arts & Global Leadership**

To do better together, a liberal arts perspective emphasizes interdisciplinarity, critical thinking, and ethical reasoning, thus promoting the all-around development of DKU students. Understanding social, political, and cultural contexts helps the students understand the meaning of technology for good and further ensures that algorithms and simulations do not reinforce inequities or unintended harm, hence promoting responsible innovation. DKU's joint model fosters global leadership by combining U.S. and Chinese educational approaches, encouraging cross-cultural collaboration, interdisciplinary study, and systems thinking. Students gain experience working in diverse teams, analyzing real-world economic problems, and reflecting on societal impacts. Integrating ethics, policy awareness, and technical skill allows future leaders to design algorithms and market mechanisms that are both effective and socially responsible, bridging computational power with human-centered decision-making.

(Word count: 123 words)

Grammarly Proofreader

Writing quality 96 / 100

The text is well-organized and clear, but some sections may benefit from sharper language and more concise tone.

Filter by category

Sharpen word choice	15
Condense lengthy sentences	11
Align tone for reflection	4
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