

We started this assignment by using a doubly linked list for the implementation of the Uno game. We believe this is where many of our issues began, because the structure became unnecessarily complex and difficult to maintain as the project grew. For the rest of the milestones, we never had the time to go back and correct that foundational design choice, which caused several cascading problems.

### **Problems with the doubly linked list:**

The doubly linked list made simple operations: drawing cards, removing cards, validating card placement, and flipping between light/dark decks, much more error-prone. The pointer management introduced bugs that were hard to trace, and adding Uno Flip logic only increased the complexity. As a result, later features took significantly longer than expected.

### **Problems with past milestones:**

Because Milestone 1 was not fully stable, we carried technical debt into Milestones 2 and 3. GUI behavior ended up depending on inconsistent model logic, tests were harder to write, and some features had to be implemented as workarounds rather than proper solutions. By the time we reached Milestone 3, these earlier issues slowed us down, and halfway through the iteration we became stuck and unable to complete the milestone in the expected time frame.

### **Problems with serialization:**

When we reached Milestone 4 and implemented save/load, the complexity of our data structure made serialization unreliable. The linked nature of the cards caused circular references and inconsistent states when trying to serialize and deserialize the game. This resulted in corrupted game states or missing information, and fixing it would have required a major redesign of the model.

Milestone 4:

### **What works:**

- Everything but serialization

### **Conclusion:**

We are deeply sorry for the limitations in our implementation and the incomplete functionality of our project. Despite the issues we faced, we hope that our work still reflects the logic, effort, and reasoning behind our design decisions are still evident and can be considered for partial credit. We appreciate your understanding.