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**Final Project Proposal**

*Group 6*

**Link/Gym Environment:**

<https://github.com/paulhendricks/gym-inventory>

**Reference Paper:**

<https://sites.ualberta.ca/~szepesva/papers/RLAlgsInMDPs.pdf>

**Rationale:**

We would like to do our final project on Inventory Management (IM) as we believe that it is a great use case for Reinforcement Learning. Given that many IM problems are sequential in nature, they are a natural fit for RL. IM is important for many companies globally as things like on-shelf availability (OSA), out-of-stocks (OOS) & properly matching supply with demand are critical to many business processes & operations.

RL offers enhancements to existing IM processes by offering the capability to make better decisions. In IM, efficiency is very important. A good IM solution ensures that there is the proper safety stock, min-mix quantities & even considers perpetual inventory vs. physical inventory -- in other words, real-time vs. static analyses of inventory. We believe that, with RL, we will be able to model an ideal solution by considering state-action pairs & associated rewards/penalties (i.e., costs).

There are clear costs associated with holding inventory too long (e.g., warehouse & otherwise) & having the ideal level of inventory helps minimize long-term cost. Considering the above, we believe that IM can be modeled with a MDP. The key idea here being mobilizing inventory to where it is needed most at the precise time it is needed most. We plan to leverage the RL concepts learned in class (referenced above) in a gym environment for our project.