PhantomReach (Team 5) – Work Plan

**Goal:**

Our goal is to develop a desktop game-driven rehabilitation tool for hand amputees. Using a standard webcam, the tool overlays a virtual hand based on real-time limb detection, providing accessible, engaging gameplay to help reduce phantom limb pain (PLP) and support motor coordination.

**Objective 1: Model Selection for Real-Time Limb Tracking**

* Collect and Annotate hand Amputees image/video data
* Evaluate through jupyter notebooks initial models (OpenPose, PoseNet, HRNet, MediaPipe Pose, YOLOv8) to determine which best tracks residual limb movement accurately and in real time.
* Run benchmarks accuracy, precision, recall, F1 scores, and FPS performance tests to finalize model choice.
* Transitioning the selected model for integrating within the game (C# with Unity, with TensorFlow)

Owner: Shoval (Data Scientist), Deadline: December 9

**Objective 2: "Phantom Reach" Game Environment and Mechanics**

* Develop a visually appealing 3D game environment in Unity, placing interactive objects with adjustable difficulty levels.
* Design and implement a virtual hand model that accurately mirrors real-time limb movements for reaching and grasping actions.
* Add a variety of 3D objects (e.g., balls, cubes) in different sizes, colors, and shapes to make gameplay engaging.
* Design a clear user interface with instructions and feedback on progress.
* Build a scoring system and set up levels that increase in difficulty, offering combo options for consecutive grasping.
* Integrate audio cues for successful actions and other gameplay events.
* Implement a system for tracking specific rehabilitation movements and providing feedback on progress over time.

Owner: Toni, Deadline: December 16

**Objective 3: Real-Time Virtual Hand Integration and Gameplay Calibration**

* Integrate the limb tracking model (Objective 1) directly with Unity for real-time tracking.
* Link the virtual hand tracking to the game environment
* Implement local storage solutions for user progress and game data. Cloud storage will enable backups and cross-device access, while local storage will support offline functionality.
* Implement privacy controls for data collection, ensuring anonymization and encryption of user data in compliance with standard privacy regulations.

Owner: Vishesh, Deadline: December 30

**Objective 4: Usability Testing, Clinical Feasibility, and POC Presentation**

* Conduct sessions with hand amputees to evaluate gameplay relevance and safety.
* Gather user feedback on functionality, engagement, and therapeutic efficacy.  
  Refine the virtual hand, tracking, and gameplay mechanics based on feedback from testing sessions.

Owners: Noa and Gal ,Deadline: 13 January