Prediction of Quantum Dynamics using Experimental Measurements

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- **Idea:** Predict the evolution of probability density function of a quantum systems from measurements of position.
- **Dataset:** We create our own data-set by simulating some theoretical systems like 1-D potential well etc.
- **Relevant Papers:**

1. *Learning to Predict Arbitrary Quantum Processes* (Dec. 2023)
   Hsin-Yuan Huang, Sitan Chen, and John Preskill, PRX Quantum 4, 040337
2. *Emulating quantum dynamics with neural networks via knowledge distillation* (Jan. 2023)
   Yu Yao, Chao Cao, Stephan Haas, Mahak Agarwal, Marcin Abram, Front. Mater., Sec. Computational Materials Science
3. *Physics Informed Deep Learning (Part II): Data-driven Discovery of Nonlinear Partial Differential Equations* (Nov. 2017)
   Maziar Raissi, Paris Perdikaris, George Em Karniadakis, arXiv[cs.AI]

- **Work Distribution:**
  - Abhishek: Literature review on Quantum dynamics, exploring possible representation(s).
  - Pritipriya: Literature review on viable ML algorithms, curating data-set.
  - Both: Slides, Reports, and Implementation of Algorithms.
- **Algorithms to be implemented:**
  - Surface regression, Physics-Informed Neural Network (PINN).
- **Midway Targets:**
  - Curating data-set and organization
  - Research about possible representation(s).
  - Implementation, optimization and comparison of 2 or more of above-mentioned algorithms.
- **Expected Results:**
  - Optimal prediction within the trained region from surface regression.
  - Optimal prediction outside the trained region from PINN.