**All About Physics Informed Neural Network**

Neural Differential Equation- A Normal Equation with neural vector fields.

Examples- GRU/LSTMs

* StyleGAN2
* Coupling Layers
* Theory of Deep Learning

Applications- Physical, Financial, and Biological Modelling

* Time Series Application (Weather forecasting)
* Generative modeling, continuous normalizing flows, and neural SDEs.

Neural Controlled Differential Equations- the input-output mapping is typically fixed and predefined.

* Having a system depends on time-varying inputs.

**How does Machine Learning work and how does PINN work?**

Machine Learning has 5 Stages.   
 Decide the problem

Current Data

Design Architecture

Crafting a Loss Function

Employ Optimization

We Embed Physics in it.

**Decide the Problem:**

**Questions to ask: Why do we need an ML Model for this problem?**

Points may help in answering. Learning new physics, Capture Expensive Physics, or surrogate modeling, Fast/Accurate, Automatic Differentiation for optimization.

**EDA For Image Processing:**

**Questions to ask: What data will inform the model?**

Points may help you in answering. Data tilt, Coordinates, and What differs the data together, is data bias, trying to explore rare events, EDA in images, and Hidden Images.

**Architecture:**

**Questions to ask. What equation to use and why?**

Points may help you in answering. Parameters, Equivariance, Invariance,

**Craft a Loss function:**

**Questions to ask. Output predicted.**

Points may help you in answering.

**Reference: -** [**https://ora.ox.ac.uk/objects/uuid:af32d844-df84-4fdc-824d-44bebc3d7aa9/files/df7623c885**](https://ora.ox.ac.uk/objects/uuid:af32d844-df84-4fdc-824d-44bebc3d7aa9/files/df7623c885)

[**https://www.youtube.com/watch?v=fiX8c-4K0-Q&list=PLMrJAkhIeNNQ0BaKuBKY43k4xMo6NSbBa&index=4**](https://www.youtube.com/watch?v=fiX8c-4K0-Q&list=PLMrJAkhIeNNQ0BaKuBKY43k4xMo6NSbBa&index=4)