Ameture Astro Engine

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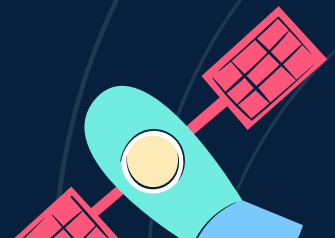
What's the project all About?
This is an engine for amateure astronomers by using it they can learn how to track celestial objects , predict astronomical events using previous data & filter astronomical images .

Project motivation : Computational astronomy is a rapidly expanding field. NASA, NRAO, STScI, and numerous other institutes have begun to open-source their datasets for research purposes. However, astronomical analysis software can be quite complex for young learners, making it challenging for them to understand and modify these tools for their use. In this project, I have employed simplified algorithms to facilitate young learners' comprehension of how these systems function, enabling them to explore and learn about computational astronomy more easily.



Key Algorithms:

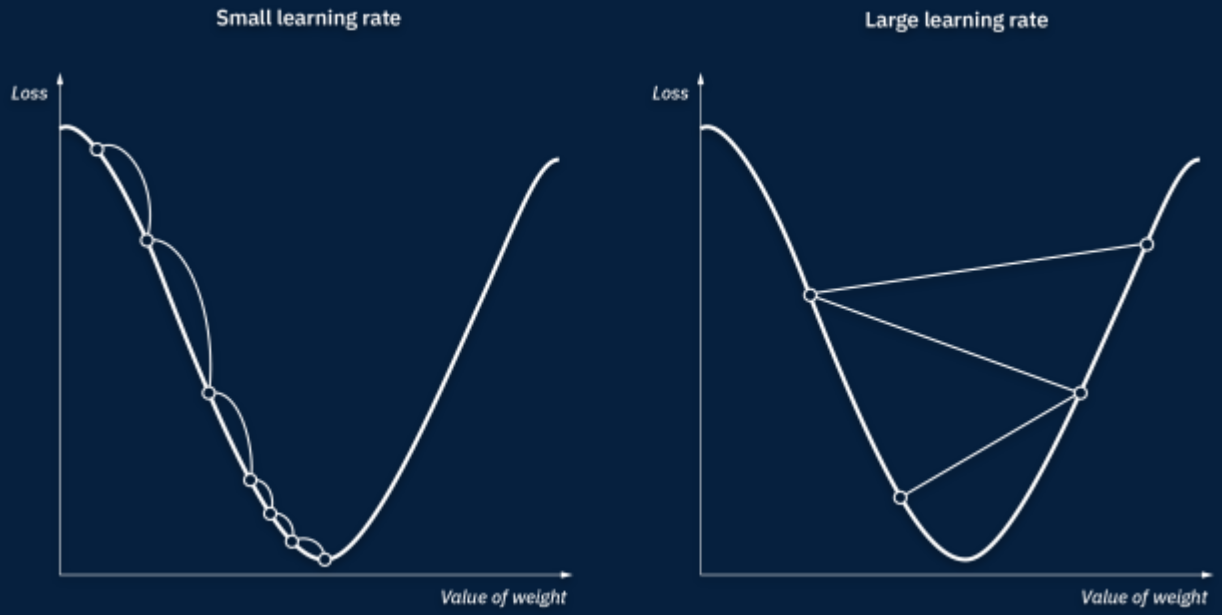
- Gradient descent
- Image Stacking
- Singular Value Decomposition

Gradient Descent:

Gradient descent is an optimization algorithm that minimizes a function by iteratively adjusting the model parameters in the direction of the steepest decrease in the function's value.

$$\theta_j = \theta_j - \alpha \frac{\partial}{\partial \theta_j} J(\theta)$$

2D:


Small learning rate
Loss
Value of weight
Large learning rate
Loss
Value of weight

3D:

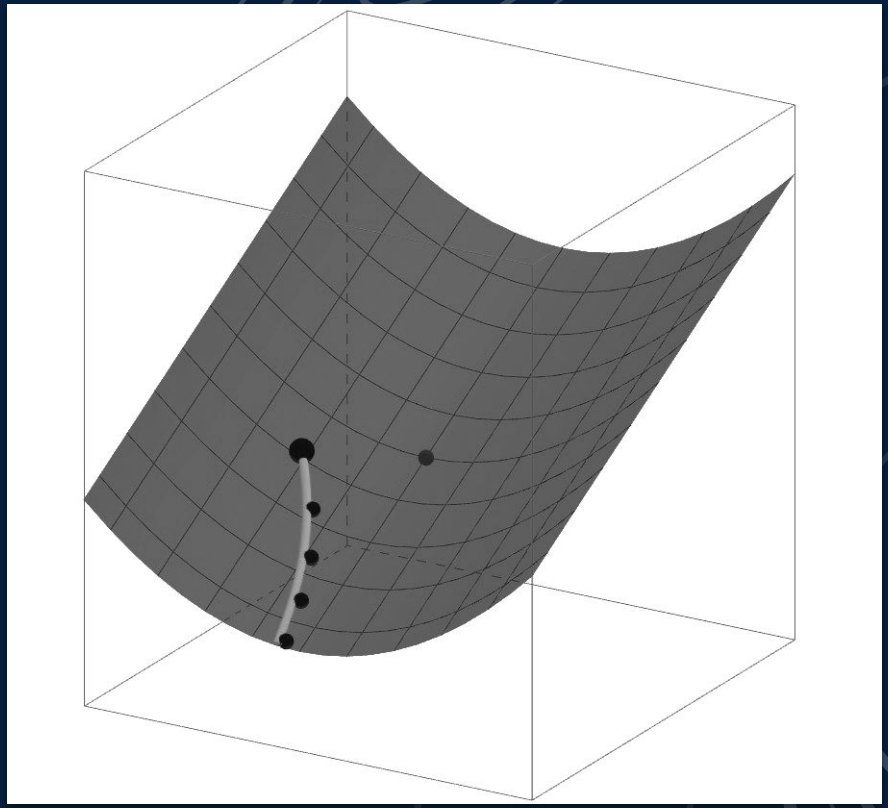
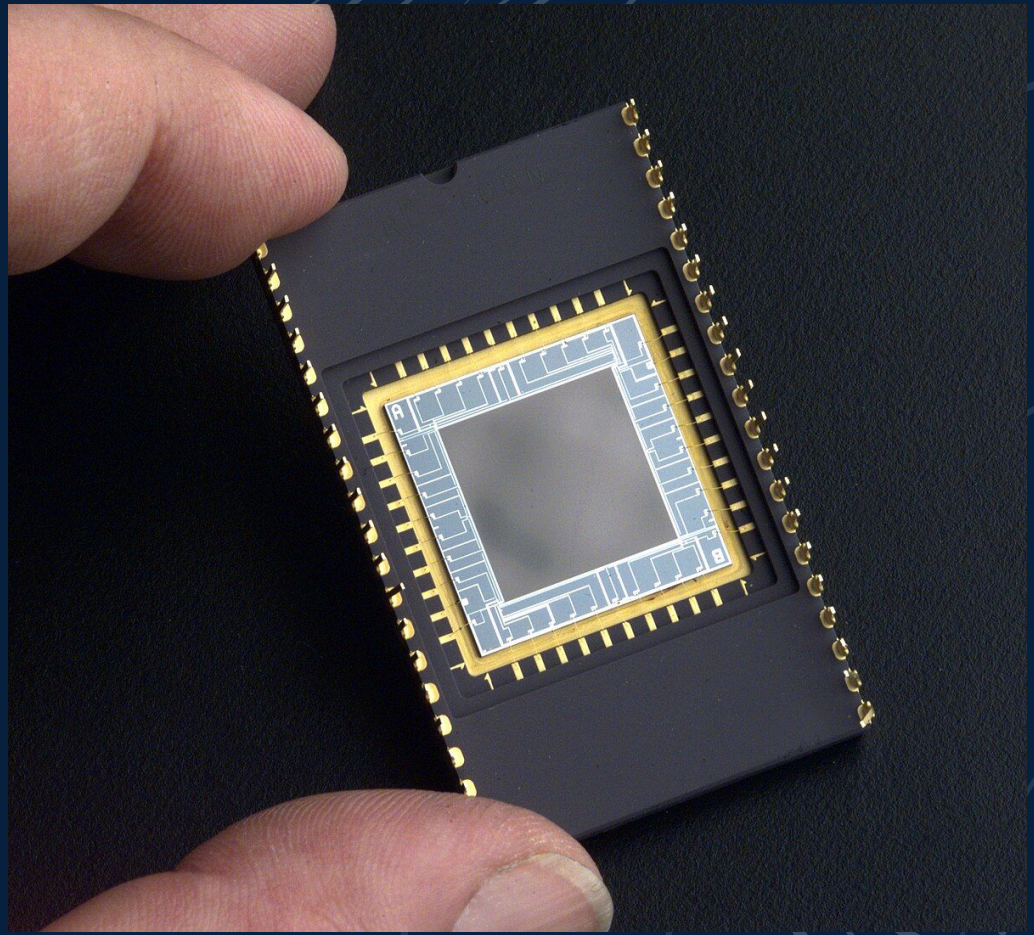
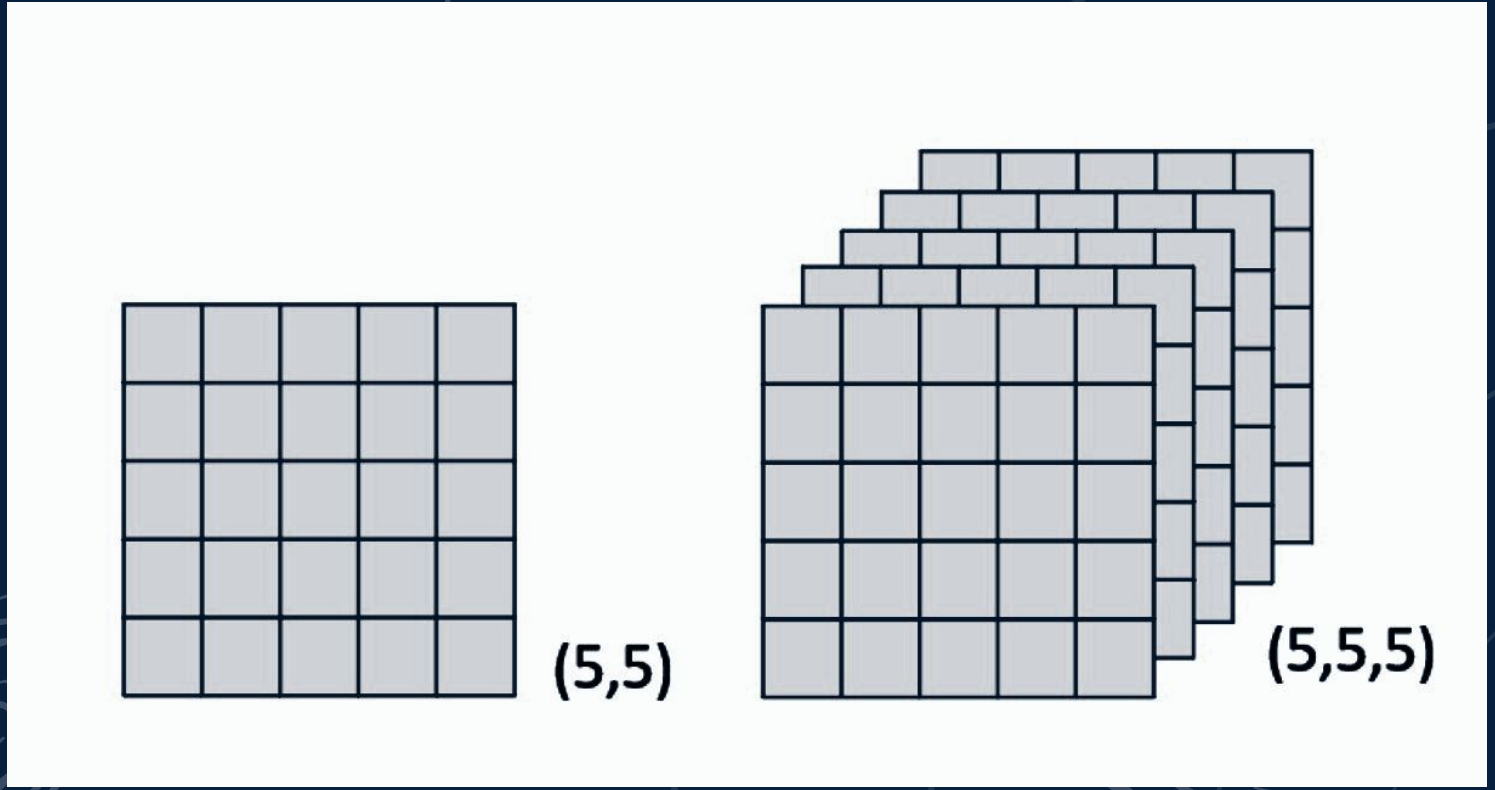


Image Stacking: Image stacking is a technique used in photography and image processing to combine multiple photos of the same subject to reduce noise, enhance details, or create long-exposure effects.

CCD:



Stacking grid of 5 images:



Singular Value Decomposition:

Singular Value Decomposition (SVD) is a mathematical technique for factorizing a matrix into three separate matrices to analyze and reduce dimensionality in data.