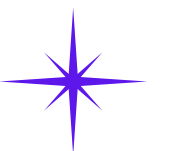
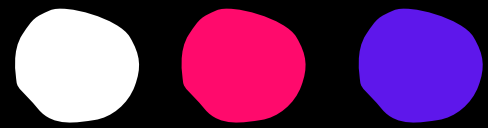


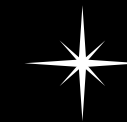
Recommender Systems using Matrix Factorization

Benrekia Mohamed Ali
Benamara Abdelkader
Djelid Aymen





Problem Statement



						
	10	-1	8	10	9	4
	8	9	10	-1	-1	8
	10	5	4	9	-1	-1
	9	10	-1	-1	-1	3
	6	-1	-1	-1	8	10

\approx

\times

R

I

U^T

1

Solutions

$$\min_{I,U} \underbrace{\|R - IU^\top\|_{\mathcal{F}}^2 + \lambda \|I\|_{\mathcal{F}}^2 + \mu \|U\|_{\mathcal{F}}^2}_{C(I,U)}$$

Stochastic Gradient Descent (SGD)

$$I_{t+1} = I_t - \eta_t \frac{\partial C}{\partial I}(I_t, U_t)$$

$$U_{t+1} = U_t - \xi_t \frac{\partial C}{\partial U}(I_t, U_t)$$

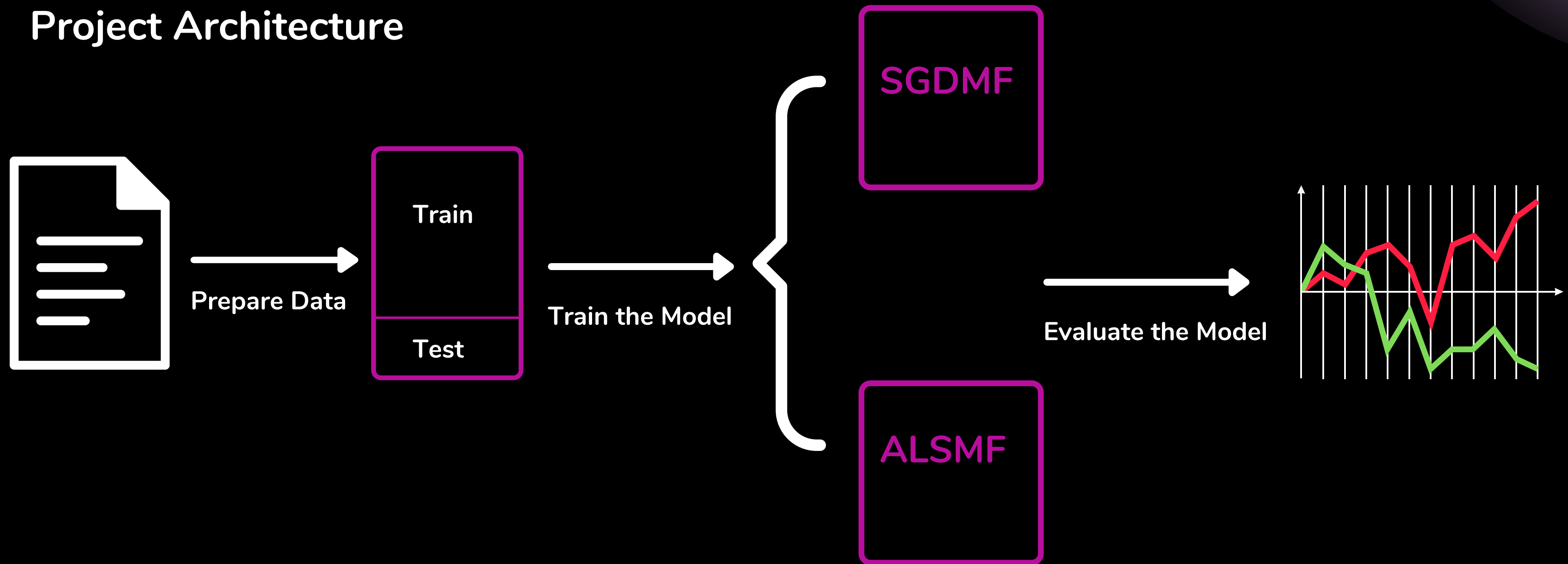
Alternating Least Squares (ALS)

$$I_{t+1} = RU_t(U_t^\top U_t + \lambda \mathbb{I})^{-1}$$

$$U_{t+1} = R^\top I_t(I_t^\top I_t + \mu \mathbb{I})^{-1}$$

Implementation

Project Architecture



Evaluation Metrics

SGDMF

SGDMF

$$\text{RMSE}(R, \hat{R}, T) = \sqrt{\frac{\sum_{(i,u) \in T} (R_{iu} - \hat{R}_{iu})^2}{|T|}}$$

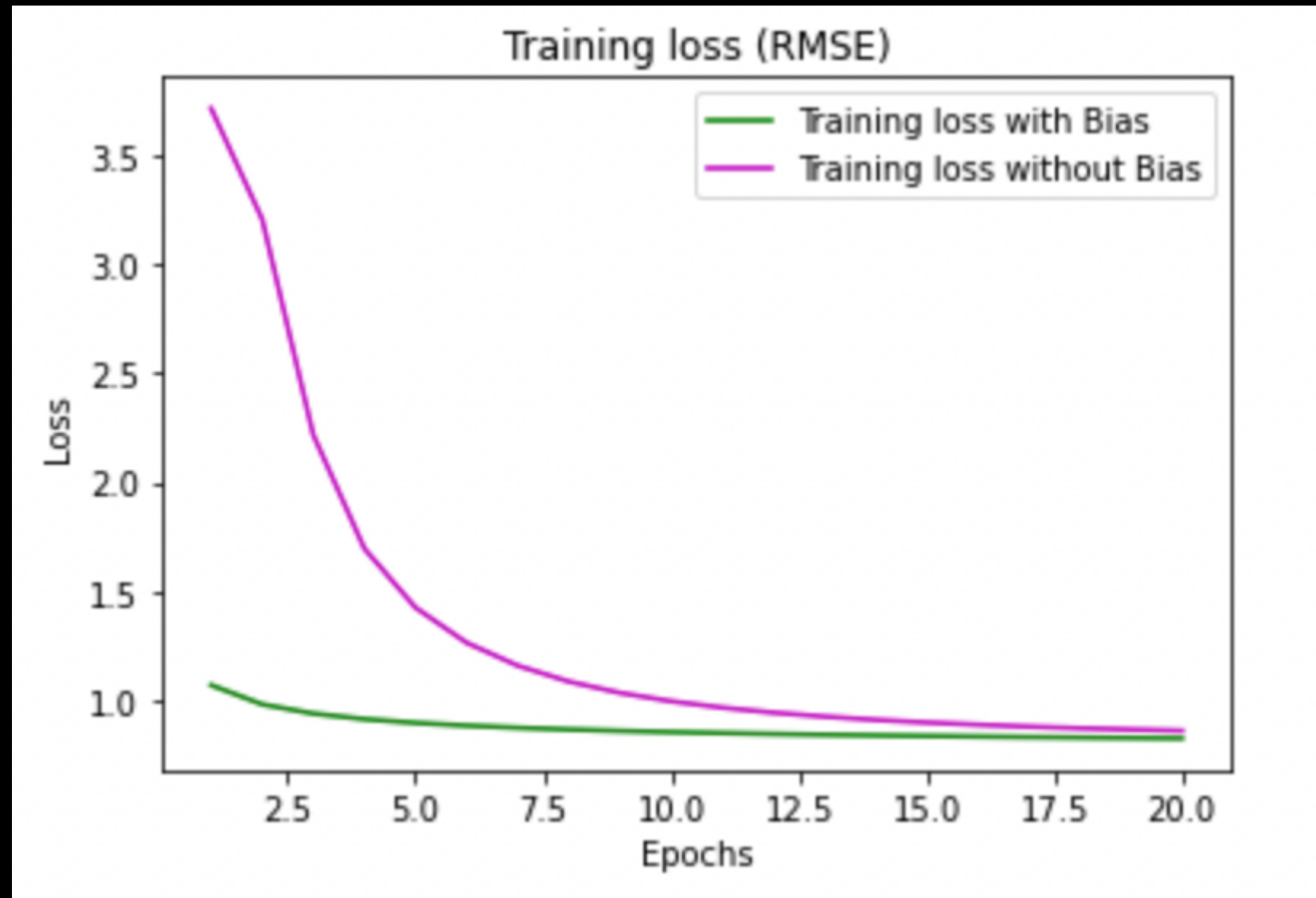
ALSMF

ALSMF

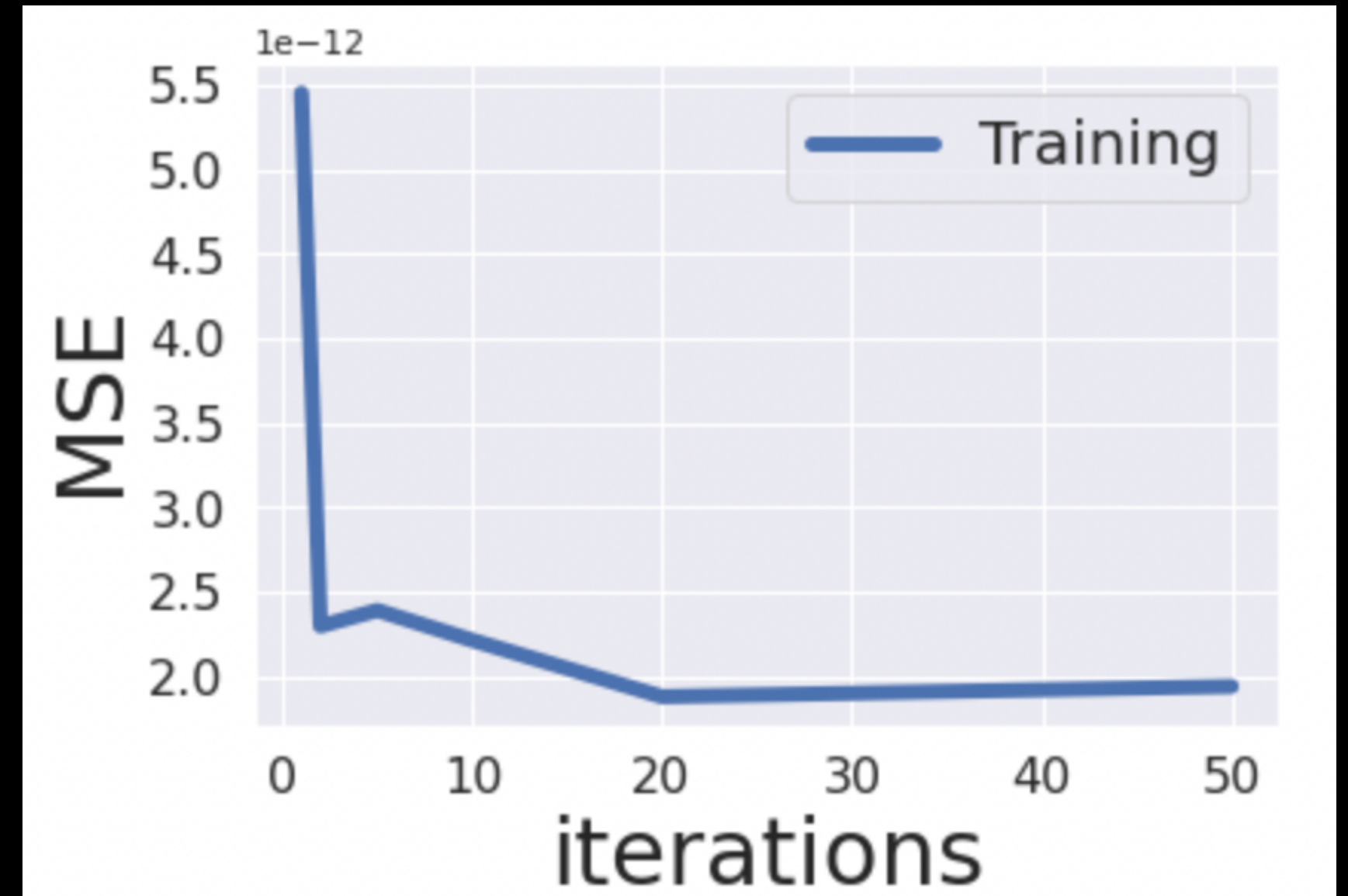
$$\text{MSE}(R, \hat{R}, T) = \frac{\sum_{(i,u) \in T} (R_{iu} - \hat{R}_{iu})^2}{|T|}$$

Primary Results

SGDMF



ALSMF



The background is a solid black field. It features several thin, wavy lines that originate from the left side and curve across the frame towards the right. These lines are colored in a gradient, starting with a reddish-pink hue on the left and transitioning into a deep blue on the right. Scattered across the black background are four white, multi-pointed starburst or spark-like symbols. One is located in the upper left, another in the upper center, a third in the lower left, and the fourth on the right side, partially overlapping the wavy lines.

Thanks for your attention