**AI ML Internship Log**

# Day 9 - Understanding C and Gamma in SVM (RBF Kernel)

# Date - 24 June 2025

# Team Role - Member

# Project Title - Personality Prediction from Social Media

**✍️ What I Did Today:**

* Focused completely on understanding the two important SVM hyperparameters: **C** and **Gamma**.
* Ran code in Colab and analyzed the effect of different values of C and gamma on model performance and decision boundaries.
* Used synthetic dataset (make\_moons) to visually observe the impact.
* Ran visualizations for different C values (0.01, 1, 100) and different Gamma values (0.01, 1, 10).
* Interpreted how model overfits, underfits, or generalizes based on these parameters.

**🤔 Confusions and Challenges Faced:**

* Initially, both C and Gamma felt similar in definition (control model complexity), which was confusing.
* Understanding what exactly gamma does was tough until visual graphs made it clearer.
* Had difficulty grasping terms like "linear separable", "overlapping", "underfitting", and "overfitting" but gradually gained clarity.

**🌐 Final Understanding & Learnings:**

* C is the regularization parameter that controls the trade-off between margin size and classification error.
  + **Low C:** Wide margin, more tolerance to errors (underfitting).
  + **High C:** Narrow margin, low tolerance to errors (overfitting).
* Gamma defines the influence range of a data point.
  + **Low gamma:** Model considers points far away → overly smooth → underfitting.
  + **High gamma:** Model focuses only on close points → overly complex boundary → overfitting.
* Best generalization occurred with C = 1 and Gamma = 1 in visual examples.
* Visualization of decision boundaries made things very clear.

**📊 Results Observed:**

* Low C or Low Gamma: Model was too simple, didn't capture data complexity.
* High C or High Gamma: Model was too complex, overfitted the training data.
* Balanced values (C=1, Gamma=1) gave the best shaped boundary for generalization.

**🚀 Self-Reflection:**

* This topic was difficult but very rewarding.
* Today was less about coding and more about deep conceptual learning.
* I now feel more confident to tune SVM parameters and explain them in an interview.
* I’m happy with my progress and will definitely revise this to strengthen my concepts.
* Visual learning is helping me understand difficult ML topics more effectively.