Problem Statement

The hackathon is divided into 2 phases. Phase 1 is where all participants take part and are asked to solve a smaller version of problem statement, related to basic planning of art restoration using deep learning in 15 hours. We conduct this phase in order to filter out the good brains in deep learning, so that our efforts are focused in Phase 2.

Phase 2 is where the participants selected in Phase 1 work on the main problem statement of creating an AI model for the Heritage paintings restoration, for a total of 15 days. This is where much of the work happens and our mentors from DST, Google and L&T also help the participants in trying to get the right solution.

End Objective at the end of Hackathon:
Create a system that reads a damaged image (with missing portions), identifies the areas that are damaged, and uses a model to fill the spaces that are missing using scientific assumptions drawn out of the sample datasets, effectively being able to restore any image similar to the sample dataset shared.

Phase 1

- Start Date: 27th September 2020
- End Date: 28th September 2020
- Timeline:
    o 11 am onwards- 15 hour counter starts

- Problem Statement & Guidelines (3 Objectives):
    o Selection of Datasets:
        ▪ Choose the dataset similar to the sample given with the problem statement. The sample is an actual painting from heritage paintings. The size of the image is also your choice, provided the function (API) can handle different sizes later, if required. The dataset should be relevant to our final objective.
        ▪ Weightage for selection: 20%
    o Creation of Roadmap:
        ▪ Develop a roadmap/ proposed flow of solution. This can be submitted in the form of a ppt/ pdf/ video. It should contain a clear path to the solution as well as the details of the dataset chosen.
        ▪ Weightage for selection: 30%

- o Creation of Logical Function:
    - Option 1: A function needs to be developed that works on the segmentation of the regions of discontinuity of an input image on a single channel/ monochrome image

    OR

    - Option 2: Create an interim function which has a logical line of thought as the overall problem statement and should be reusable/ scalable in the next phase of the hackathon
    - Weightage for selection: 50%

- End Objective for Phase 1:
    - o Create the basic structure or framework (with logical functions) of the plan needed in the second phase.

Phase 2

- Start Date: 29th September 2020
- End Date: 13th October 2020
- Timeline: 15 days

- Problem Statement & Guidelines:
    - o Create a Generator Model that can regenerate broken paintings with filling of missing parts (discontinuities):
        - Build a function that can objectively identify the discontinuities and the missing elements
        - Build functions that can choose the right missing elements for the various types of missing elements identified in the above-mentioned functions. The choice of the right missing elements will be driven by the learning of the data sets in this problem statement
        - Create multiple outputs out of the above-mentioned functions and create functions to choose the most relevant output (optimization of the functions)
    - o Create a Comparator or Discriminator Model to compare results of the outputs of the generative model with real image and provide probabilities of accuracy
        - Create a function that can compare generated output with the accepted output and calculate level of accuracy
        - Based on multiple data sets, calculate and provide probability functions mentioning the expected level of accuracy of restoration for any image that enters the generative model.
        - Train the generative model accordingly along with further training of this comparator model. Try to reach "equilibrium".
    - o Provide a final model based on the best possible equilibrium that was reached during the hackathon. If you have more time, you can also create

your own innovative models, such as a model that can be used to further improve the outputs by creating a context-specific network where the network can have inputs from historical and cultural references. Some other such innovative extension of GAN can also be considered and created or suggested.

- o You are allowed to use any model as long as you reach the core objective planned.
- o Create a basic user interface that allows you to demonstrate the functioning of your model.

- End Objective for Phase 2:
  - o Create a Model that can restore broken images (similar to the initial sample dataset shared) and be able to demonstrate the same to any user while suggesting the level of accuracy achieved by the model

- Weightage of Phase 2:
  - o Accuracy of the model in overall restoration: 40%
  - o Ability of the model to be scaled up and used for Heritage paintings: 35%
  - o Overall presentation and explanation of the model: 15%
  - o Overall user interface while demonstrating the model: 10%
  - o Innovation in the methodology: Gestalt Marks

Special Note after end of Hackathon:

We are aware that the work done through this hackathon will not be the final work that can be considered as an accurate restoration of the said paintings. The selected entries shall be given a chance to work with Sapio Heritage Restoration Team, and improve upon the algorithms created during the hackathon, by adding modules with detailed historical and cultural references along with modules that identify various other parameters that define the artist and their art (e.g. type of brush used, level of brightness preferred, etc.). In places like Ajanta there have been numerous artists working over a period of 900 years hence identifying each style of every artist becomes critical.

Only after these required improvements will a minimum viable product be readied. After such a product is readied, it will go through layers of rigorous training on various sets of actual data. *Hence we will prefer entries that have a strong vision and take into account the future of the project as well.*
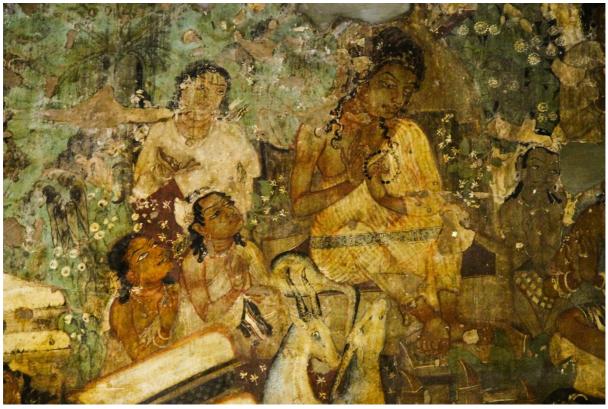
Sample Images:

Image 1

Image 2