CS 445 Final Project Proposal – ML Texture Transfer

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Motivation

We aim to implement a ML solution which takes an input image and applies one of several pre-defined styles, similar in use-case to the prior Texture Transfer project. We intend to take an open-weight model, pretrained for image-to-image tasks, and perform parameter efficient fine tuning techniques to tune the output to stylistically match that of one of several famous artists. Namely, we seek to implement a neural architecture capable of transforming input images into the style of e.g. Vincent Van Gogh, Oscar-Claude Monet, or Edvard Munch.

We are seeking the opportunity to bridge the gap between our course in CS 445 and modern industry approaches, augmenting image-image ML models using open repositories and standard tooling (huggingface, pytorch, etc).

Milestones

Done On	Duration	Milestone
Nov 8	1wk	Literature review – determine which model(s) to explore, which fine-tuning/PEFT techniques
Nov 22	2wk	Dataset construction – creating a comprehensive list of artists to emulate and consolidating high quality versions of their art
Nov 29	2wk	Fine-tuning / training – modifying the model for our purposes
Nov 29	1wk	User interface implementation – creating a simple but user-friendly front-end
Dec 6	1wk	Evaluation – interpreting results and looking for improvements or future direction

Evaluation

We will benchmark our method through visual comparison of outputs between this model and the prior Texture Transfer project, through counting artifacts and/or blemishes and using an arbitrary rating scale or ranking between different images. We will also investigate quantitative methods, including runtime comparison and similarity indexes between the inputs and outputs.

Resources

- We will need access to compute resources to fine tune the model. Paul has access to NCSA's HAL (PPC64LE) cluster and the Illinois Campus Compute cluster.
- We will need high quality versions of classical paintings in sufficient numbers. Specifically, we need a sizable corpus from each chosen artist. This should be findable online.
- We will need collaboration tools. We both have familiarity with GitHub as a way of quickly collaborating on code.

Group Contributions

Paul: I will contribute in literature review, splitting research duties with Matt. I bring existing ML experience, primarily with NLP, and will be doing image-image models for the first time. I also have knowledge of evaluation metrics and access to campus cluster and compute resources. I will be working closely with Matt so he can learn about ML and be an equal contributor to the project.

Matt: I will contribute through coordination with Paul, splitting duties on research. This is my first time doing any work with ML, and I will be using the experience to learn from Paul and contribute wherever I can. I will also be responsible for the GUI, as this overlaps well with my existing skillset.