HomoGAN

Final Project

Artificial Intelligence with Deep Learning
Postgraduate Course 2019-2020

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Index

- Motivation
- Proposal
- Milestones
- Project Plan
- Results
- Conclusions

Motivation

- Build a GAN based on DCGAN that generates faces conditioned by the features previously selected and explore the different approaches of the state-of.-the-art literature to improve results.

Recap: Goals

✓ Be able to design and train a GAN capable of generating faces.

✓ Implement and compare different architectures for the generator and the discriminator.

✓ Balancing the loss between the generator and the discriminator.

✓ Condition the GAN to be able to generate faces given some features.

Proposal: Implementation

Proposal: Final architecture

- **Feature matching**: by feeding the data with its labels, both generator and discriminator are conditioned. [1]
- **ADAM optimizer**: optimizer that combines the best properties of the AdaGrad and RMSProp algorithms to provide an optimization algorithm that can handle sparse gradients on noisy problems. [2]
- **Label smoothing and flip labels**: mislabel and flip labels in order to increase robustness . [3]

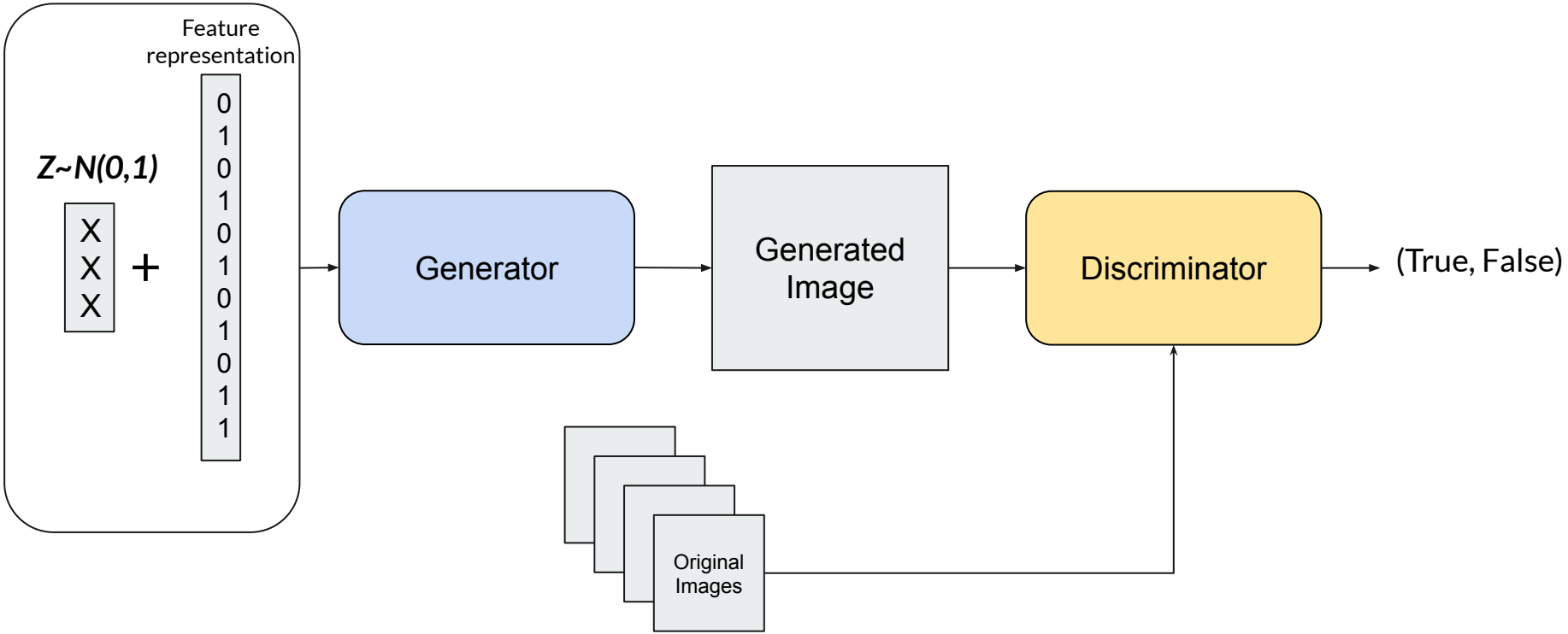
Explored techniques (Did NOT improve our results):

- Batch Normalization.
- Gaussian Noise.
- Spectral Normalization.

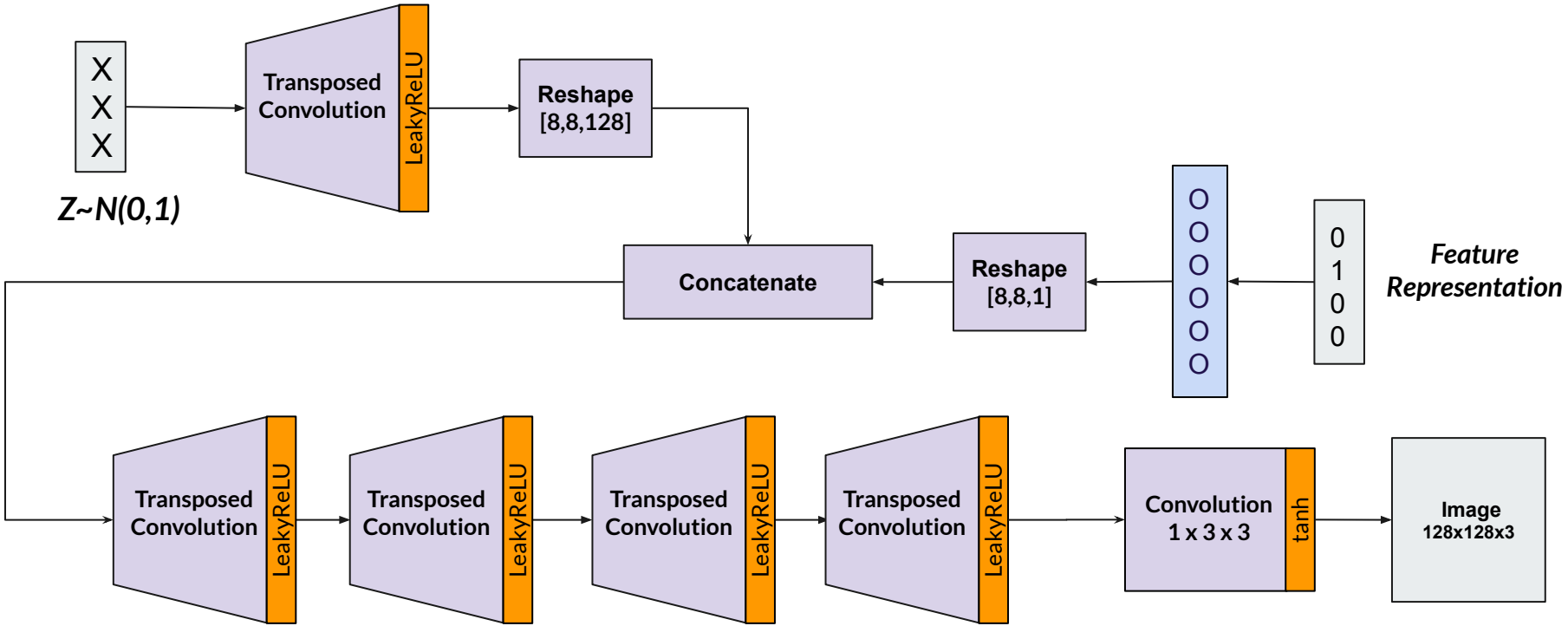
Future work:

- MiniBatch Normalization.
- Attention.
- Add noise to images.

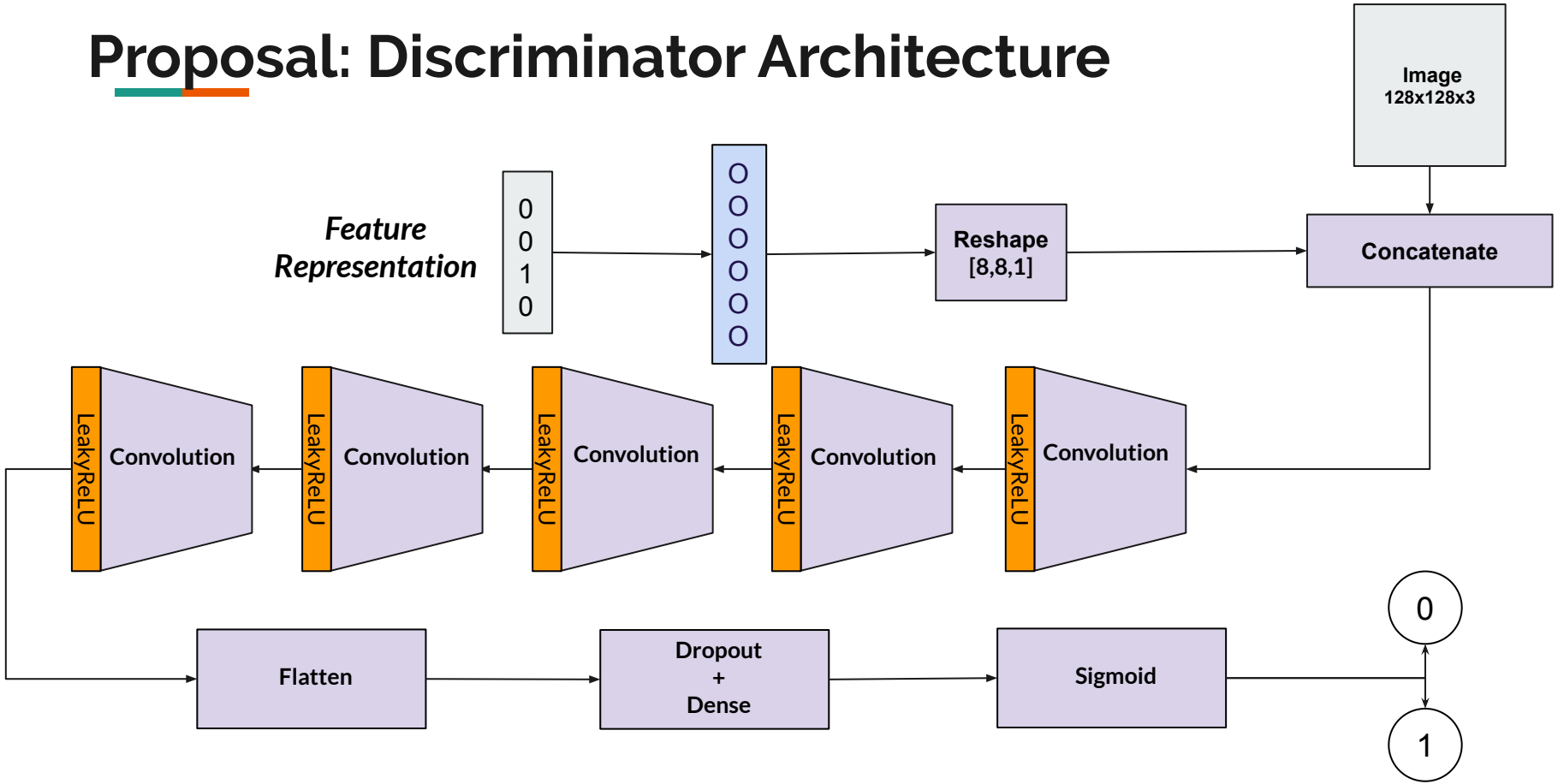
Proposal: GAN Architecture



Proposal: Generator Architecture



Proposal: Discriminator Architecture

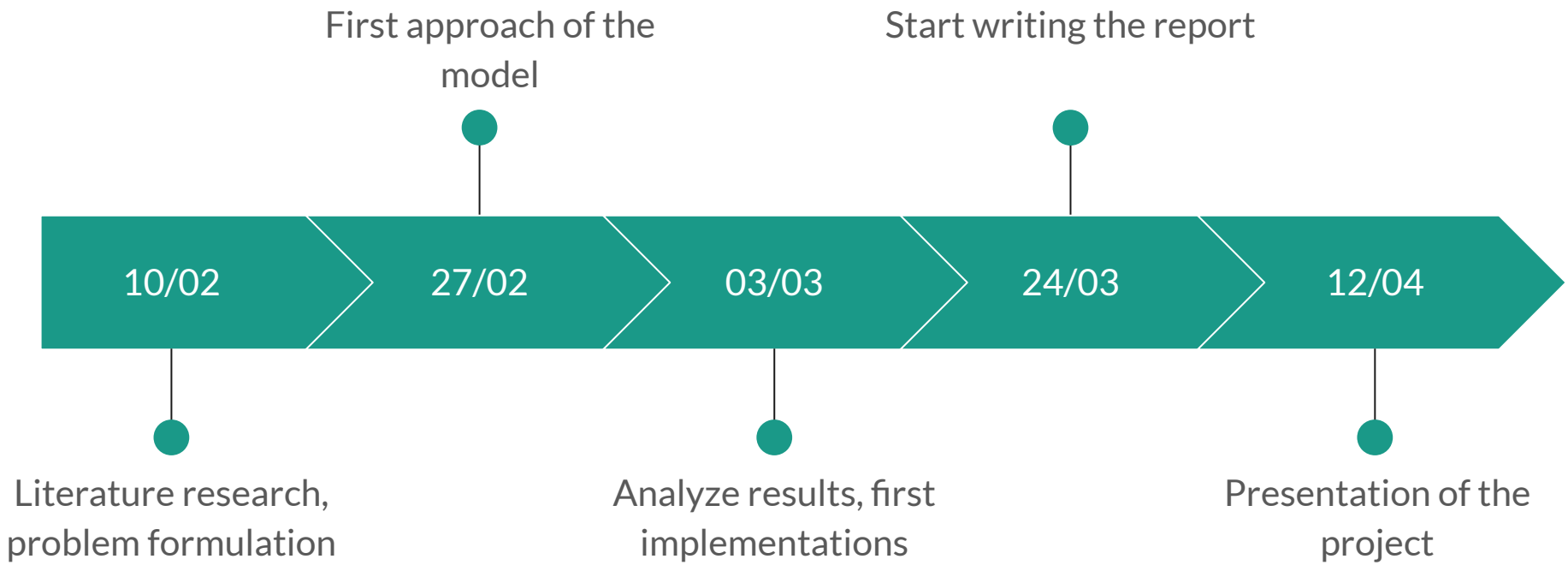


Proposal: Dataset

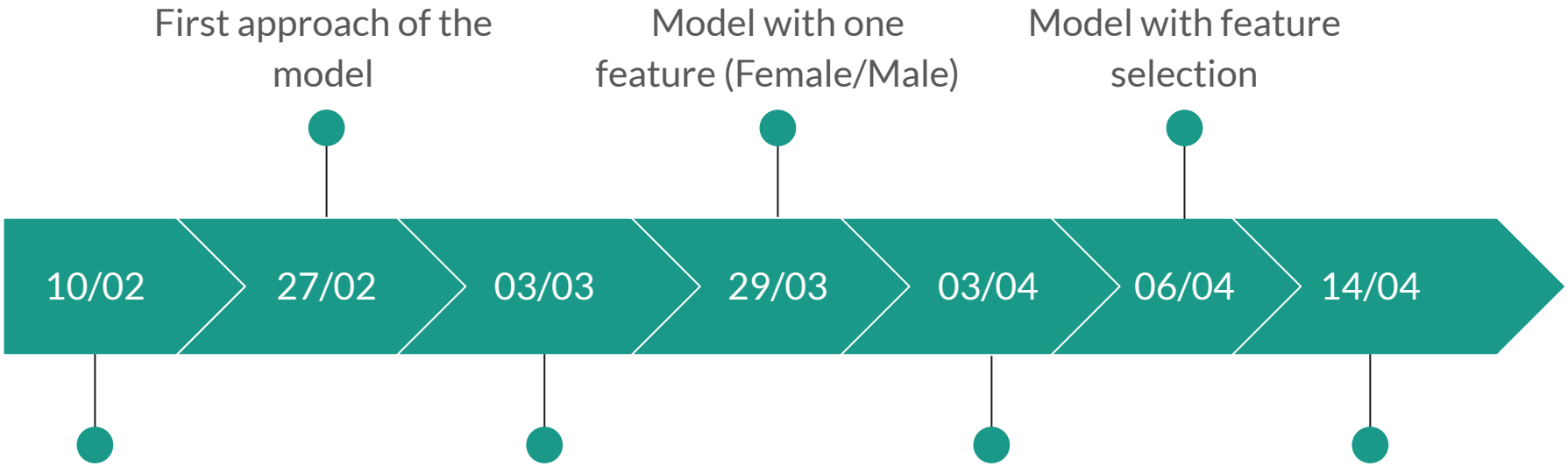
CelebFaces Attributes Dataset (CelebA) is a large-scale face attributes dataset with more than **200K** celebrity images, each with **40** attribute annotations. The images in this dataset cover large pose variations and background clutter. CelebA has large diversities, large quantities, and rich annotations, including

- **10,177** number of **identities**,
- **202,599** number of **face images**, and
- **5 landmark locations**, **40 binary attributes** annotations per image.

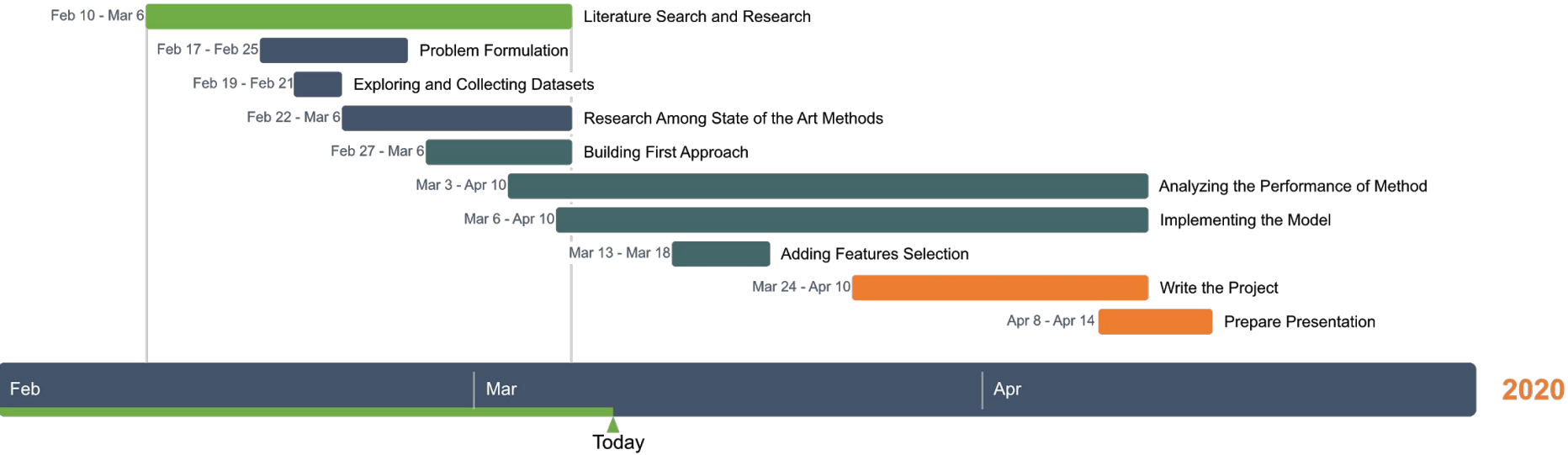
Milestones (planned)



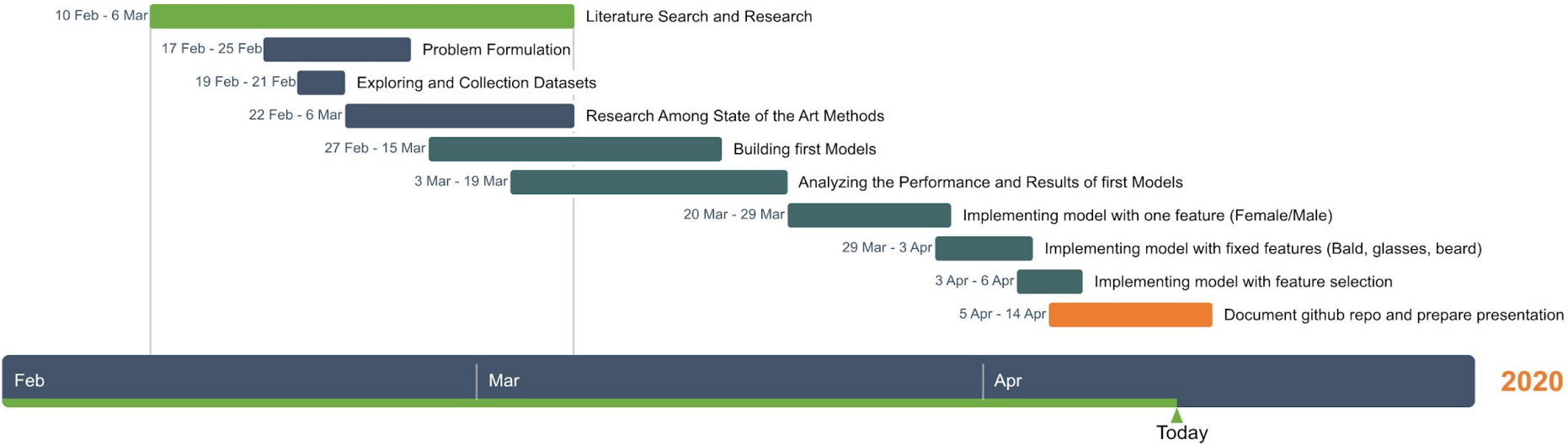
Milestones (actual)



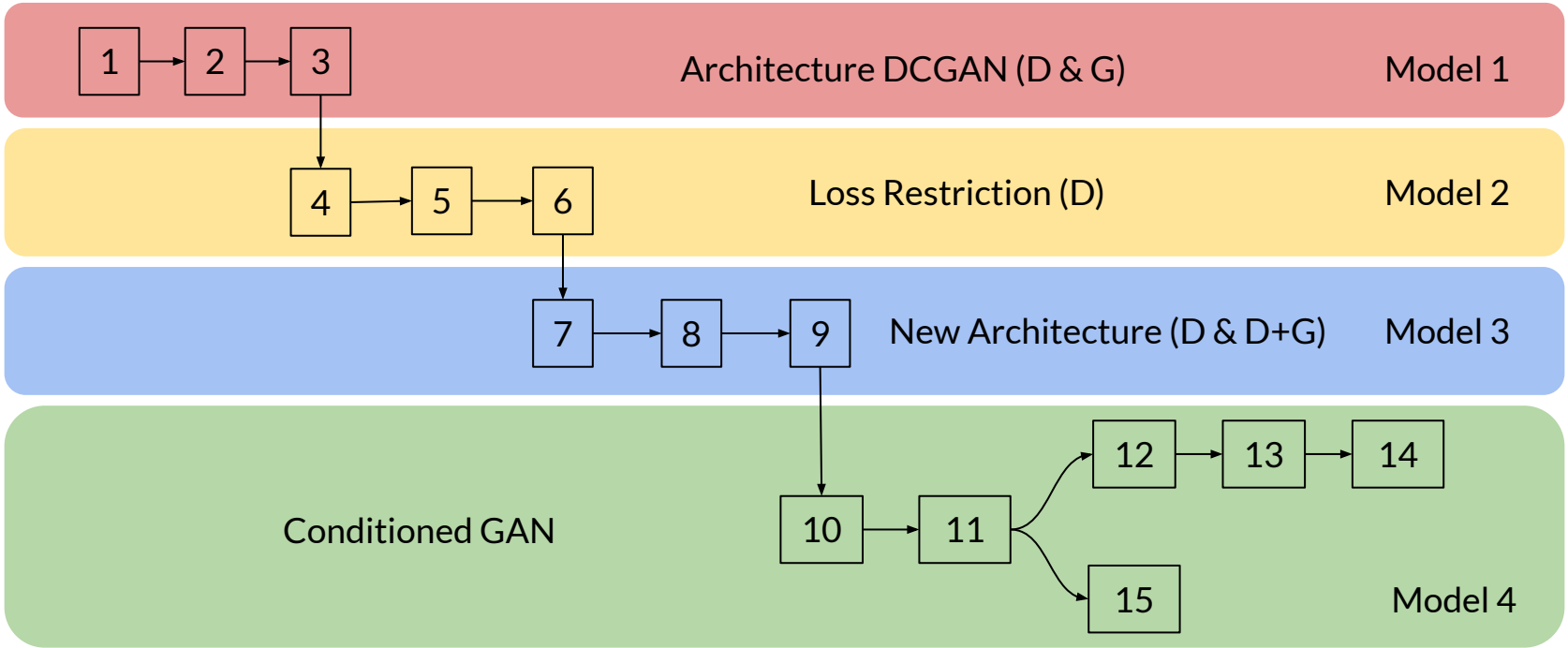
Project plan: Gantt Chart



Project plan: Gantt Chart



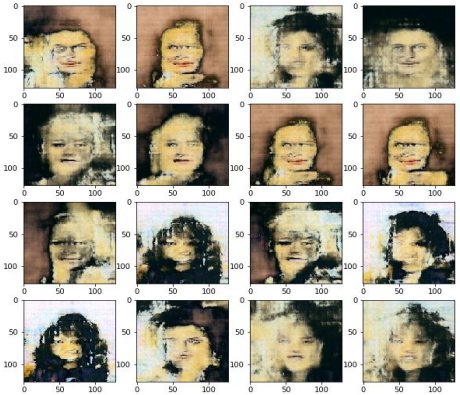
Experiments



Results

First Approach

Generated images Epoch 19



Generated images Epoch 49

Results:

Git Repo

Conclusions

- Normalization did NOT improve our results.
- Bigger batch sizes lead to better results (16 vs 100).
- Reduce space complexity improve results (filter by features).
- Train D more than G improve results.
- Our model lead to “Blank” images, periodically (cause unknown).

References

[1] Mirza, Mehdi, and Simon Osindero. “Conditional Generative Adversarial Nets.” ArXiv.Org, 2014, arxiv.org/abs/1411.1784.

[2] Radford, Alec, et al. “Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks.” ArXiv.Org, 2015, arxiv.org/abs/1511.06434.

[3] Salimans, Tim, et al. “Improved Techniques for Training GANs.” ArXiv.Org, 2016, arxiv.org/abs/1606.03498.

Project repository

https://github.com/anieto95/homogan

Questions