Minor Project

Sem 20211

Generating 3D image from a single RGB-D image

Group number 2

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Motivation:
3D image generation has a lot of useful applications ranging from enhancing self-driving cars' capabilities to adding value to the multi-billion dollar AR/VR industry. But, 3D photography is rare, resource intensive and only accessible to the most professional use cases.

Description:
We aim to develop a web tool that can realistically convert an uploaded normal RGB-D image into a 3D image, using the recent developments in the Computer Vision field.

Requirements from end user's perspective

- A web interface with an image upload button
- A button to generate the 3D image.
- A UI that visualizes the generated 3D image.
- A download button to save the generated 3D image.

Tasks for developers:

- Fixing the scope of the project, deciding the genre of images.
- Choosing and training an ML model with sufficient metrics.
- Deploying the ML model on a Cloud hosting service.
- Building up the backend and the front-end of the server.
- Deploying the server on a cloud service provider.
- Integration testing & unit testing.

UI:
For now, we've kept UI simple and functional. Here are the design mockups of two web views:

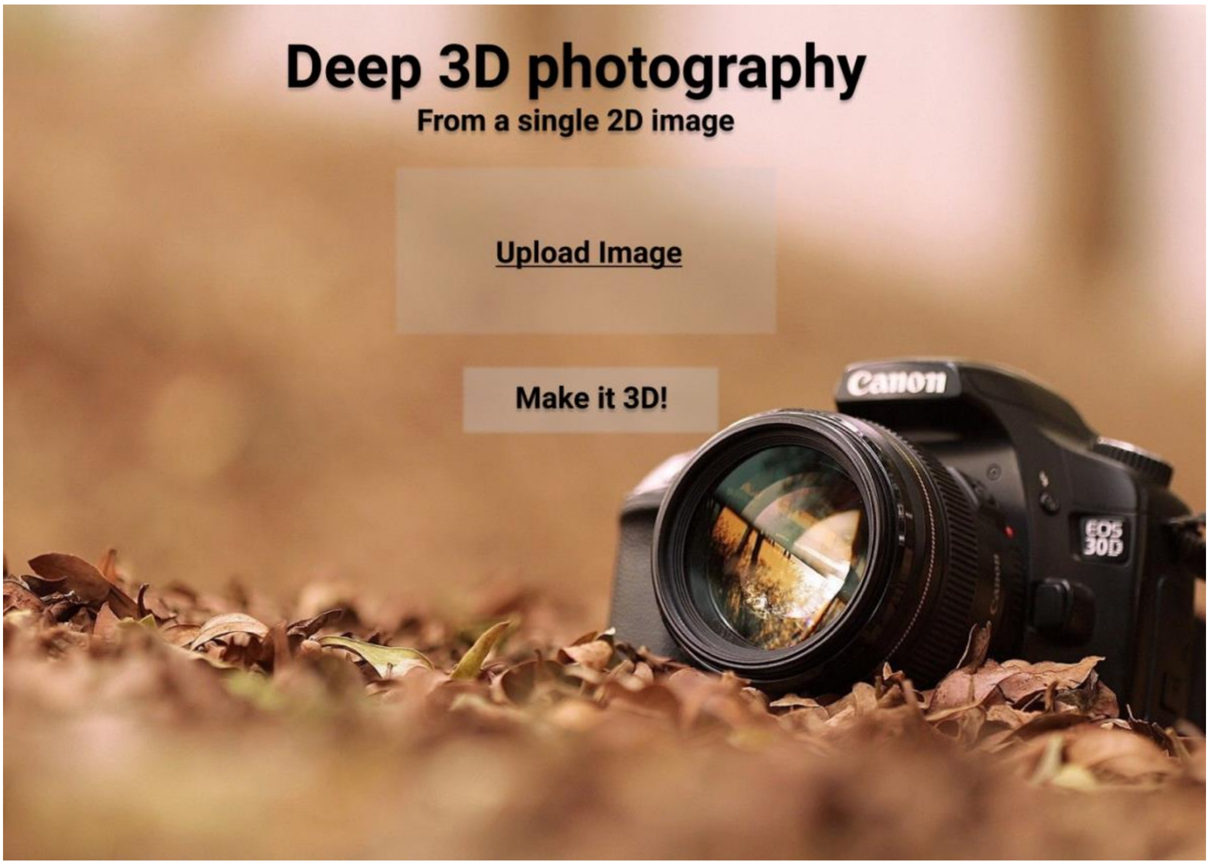


Figure 1 Home page. User will upload a picture

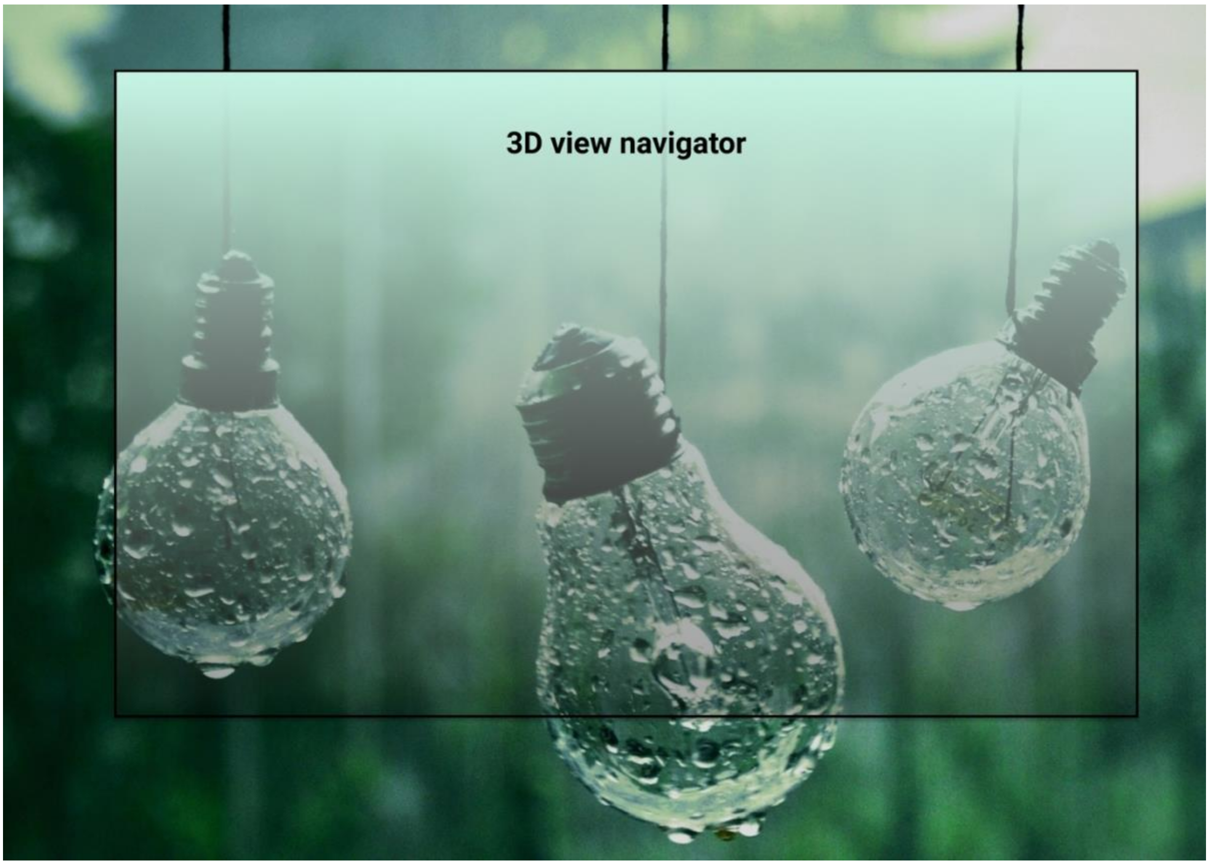
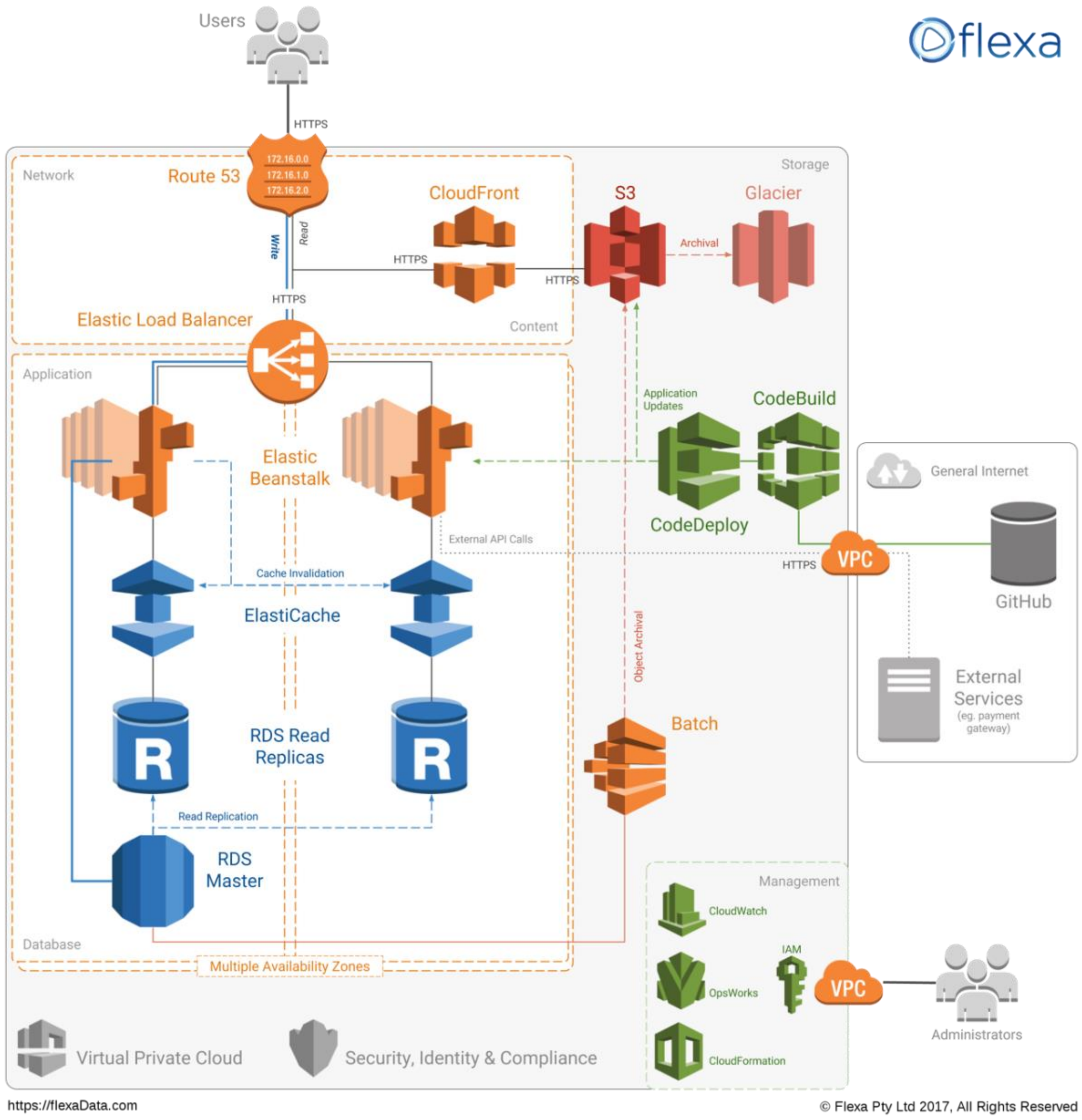


Figure 2: In the dialog box, users will be able to interact with the image in 3D

Architecture:
We’ll be utilizing AWS services to achieve Continuous Integration. Following architecture will be followed, which is also the recommendation of AWS for a web apps.
The model will be continuously trained and deployed via the CodeDeploy service.



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Tech Stack:

- Python for Deep Learning implementation.
- Angular and other JS frameworks for front end.
- Node JS or Django for the backend, depending on ease of integration with AWS and availability of documentation.

We'll be following the Agile Software Development model.

There is a lot of research happening in this field, and we will be building on the contributions by various academics:

- https://shihmengli.github.io/3D-Photo-Inpainting/
- Connelly Barnes, Eli Shechtman, Adam Finkelstein, and Dan B Goldman. Patchmatch: A randomized correspondence algorithm for structural image editing. In ACM Transactions on Graphics, volume 28, page 24, 2009.