# Final Project Progress Report

## Definitions

**Team name: Dino QR**

**Team members: Ben Gershuny, Isaac Hilton-VanOsdall, Oscar Newman**
*Note:* Once one person uploads the report to Gradescope, please add all other team members to the submission within the Gradescope interface (top right on your submission).

**TA name: Yang Jiao**

## Project

- *What is your project idea?*
  Our idea is to build a system that completely revamps the way QR codes work. QR codes are ubiquitous now, and addressed some of the pitfalls of traditional bar codes in their capacity to hold more data with many levels of redundancy, which allows them to be decoded very quickly and reliably. The problem we see with QR codes, though, is that they are static. This means that they can't be trusted to hold any kind of sensitive, time-dependent information, because once a QR code is generated it can be easily replicated without any means of identification or validation of who exactly is displaying it. One good example of this issue is for QR codes on tickets to events (or even boarding passes on planes), one could easily share a screenshot or copy of their QR code to others without the recipient having any idea that an unexpected person is using the code. We want to build a system that enables QR codes to be secure by dynamically encoding them with data that would be intrinsically time-stamped and ideally cryptographically signed, so that a scanner of the code can trust that the code is both up to date and coming from a trusted, known entity. The way we picture doing this is to have a system that displays a live-generated animated QR code that can encode time-stamped, cryptographically signed dynamic data, and a scanner that can read, verify, and decode this dynamic QR. We envision trying to implement this system for deployment on mobile devices, most likely with SwiftUI to start with, and then hopefully developing a JavaScript library for a web interface. While this is a fairly broad-scoped software project, the bulk of the work will be developing the computer vision side of generating these dynamic QR codes and then decoding them from camera image inputs.
- *What data have you collected?*
  We have not collected any data because we will be generating QR codes to test our implementation. We have begun the process of writing code to generate these QR codes to test on.

- *What software have you built or used?* We have built a QR code generator that will be fully functional with an additional hour or so of work. This will be used to generate random codes that we can use for testing. We have also begun to build a decoder for these QR codes, but this is a more laborious process so we are still in the early stages of development.
- *What has each team member contributed thus far?* Since the previous checkpoint, we have divded the labor into three parts: Ben has been working on a QR code encoder, Oscar has been working on researching the process for converting an image into a grid of binary squares, and Isaac has been working on a decoder that will takes this grid of binary values and decodes it into the original encoded message.
- *What intermediate results have you generated?* Since we have not yet completed any of these pieces of the project, we do not have any results to show yet other than some incorrectly generated QR codes made by the generator. With a little more work these will be correct and we will be able to focus on the more complex task of decoding these codes.
- *What problems have you faced or still have to consider?* The greatest challenge we anticpate is transforming an image from a camera into a grid of binary values, as we will need to rectify any distortion and detect the tracking boxes. While we anticipate this being a challenge, since the intended use of this project is scanning items from a phone screen, we can make certain assumptions about the input image, such as the fact that it will be a complete QR code without much disortion. This being said, we will still need to account for things like reflection coming off of the screen.
- *Is there anything that we can do to help? E.G., resources, equipment.* There is nothing we need currently, but we will reach out if something arises!