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Dose of Digital Health

Dexcom - continuous glucose monitoring company

>30% growth last year

Expanding into type II DM (low intensity insulin)

Partnering with Teladoc (telemedicine)
Dose of Digital Health

- **ZocDoc** lands **$150M** to expand to virtual care and vaccine scheduling
- **RapidSOS** to scale its emergency response data platform with **$85M**
- Mental health and wellness platform **Modern Health** raises **$74M**
- Provider mental health platform **Alma** receives **$28M**
- Personalized patient health network **PatientsLikeMe** obtains **$26M**
- Surgical intelligence platform **Theator** gets **$15.5M**
- Rock Health port co **Sitka** snags **$14M** to expand its telehealth specialty care network
- Eating disorder treatment platform and port co **Equip** closes **$13M**
- Provider payments platform **Gentem Health** gets **$10M**
- Medicare and healthcare marketing automation solution **Insightin Health** grabs **$12M**
- At-home lab testing startup **Base** bags **$3.4M**

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Announcements

Santiago Gutierrez
Oliver Aalami
Mike Hittle
Varun Shenoy
Aish Venkatramani

Winter 2020
2021 GSB Healthcare Conference

Wed March 3rd, 11am-6pm Virtual!

Keynote Speakers
Annie Lamont, Managing Partner at Oak HC/FT
Marcus Osborne, SVP Walmart Health

Select panelists include:
Amar Kendale, Chief Product Officer, Teladoc
Doug Hirsch, CEO, GoodRx
Vineeta Agarwala, General Partner, a16z, and Stanford Physician
Patrick Conway, CEO of Care Solutions, Optum
Kathleen Janus, Office of the CA Governor Gavin Newsom

https://www.gsbhcc2021.com/

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Assignment #4: App (beta) Release

Rev. 02.16.2021

Each team will have different deliverables, we will focus on core features!

- (CareKit) track and visualize medication adherence over time.
- (ResearchKit/CareKit) use charts to pull data from Firestore & visualize progress.
- (HealthKit) track fitness data and electronic health records.
- (HealthKit) integration with bluetooth blood-pressure cuffs! (Omron)
- Provider Data Visualization - web app, provider app, ETL <-> REDCAP
- Integration with iBeacon bluetooth sensors (location-awareness)
- Integration of CoreML for image processing (+visualization of results)

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Overview for today

- CareKit + ResearchKit + GCP
- Downloading data from Firestore
- ResearchKit Charts
- Preview of HealthKit

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CareKit

Tracking Function
Create treatment plans and track patient progress.
Give your patients a daily to-do list and empower them to take control of their care.

Intervention and Effectiveness
Gather insights and identify trends over time.
Display charts to provide meaningful insights and trends to patients.

Connect
Stay connected to your patients.
Enable patients to connect to their care providers with a single touch.

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CareKit + GCP

CareKit - developed with the goal of helping track the development of symptoms and adherence to medication over a period of time.

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CareKit + GCP

coreDataStore = OCKStore(name: "CKSampleCareKitStore", securityApplicationGroupIdentifier: nil, type: .onDisk( protection: .complete), remote: CKCareKitRemoteSyncWithFirestore())

CKCareKitRemoteSyncWithFirestore
Open-source synchronization remote from CardinalKit

CKCareKitRemoteSyncWithFirestore.swift on GitHub
CareKit + GCP

CKCareKitRemoteSyncWithFirestore.swift

Example of how you can pull back this information from GCP and parse it.

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“Backend” Architecture

- Firebase
  - iOS SDK
  - Web SDK
- Cloud Identity
  - Authentication

- Google Cloud Healthcare API
- Google BigQuery
- Google Cloud Storage
- Cloud Firestore
- NoSQL Database

...and more!
"Backend" Architecture

Firebase

Provider App

Firebase

Patient App

Cloud Identity

Authentication

Google Cloud Healthcare API

Google BigQuery

Google Cloud Storage

Cloud Firestore

NoSQL Database

and more!
CareKit Sample

This project is a demonstration of how to integrate CareKit and ResearchKit with GCP Firestore.

LIVE DEMO
https://github.com/cs342/CareKit-Sample

Download the repository above to follow-along and get started

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v1.2.0

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v1.3.0 - https://github.com/CardinalKit/CardinalKit
New format for surveys,
+ CareKit Firestore sync module
How can I update my CardinalKit app to the latest version?

Syncing a fork

Sync a fork of a repository to keep it up-to-date with the upstream repository.


OR

“git pull” (or merge) the latest CardinalKit main branch into your repository

OR

Cherry-pick what you need from the latest release candidate pull request (files changed): (e.g. v1.3.0 PR: https://github.com/CardinalKit/CardinalKit/pull/51)
Accessing data to Firestore

Get a document

The following example shows how to retrieve the contents of a single document using `get()`:

```swift
let docRef = db.collection("cities").document("SF")

docRef.getDocument { (document, error) in
    if let document = document, document.exists {
        let dataDescription = document.data().map{String.init(describing:)} ?? "nil"
        print("Document data: \(dataDescription)"
    } else {
        print("Document does not exist")
    }
}
```

ViewController.swift
Charts and Graphs

ResearchKit

- Pie Chart
- Line graph chart
- Line graph chart with multiple lines
- Discrete graph chart
- Discrete graph chart with multiple points

CareKit

- Line chart
- Bar chart
- Scatter chart

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DEMO

Charting ResearchKit data (from GCP Firestore)
Enabling offline data

Firestore supports offline data persistence. This feature caches a copy of the Firestore data that your app is actively using, so your app can access the data when the device is offline. You can write, read, listen to, and query the cached data. When the device comes back online, Firestore synchronizes any local changes made by your app to the Firestore backend.

https://cloud.google.com/firestore/docs/manage-data/enable-offline
HealthKit enables us to read health and activity data from the iPhone — this includes step count, heart rate, flights climbed, calories burned, health records, and other similar metrics.
Empower your patients with Health Records on iPhone.

The Health app makes it easier than ever for users to visualize and securely store their health records. Now your patients can aggregate their health records from multiple institutions alongside their patient-generated data, creating a more holistic view of their health.

21st Century Cures Act Final Rule (March 2020)

- Rules to prevent INFORMATION BLOCKING
- FHIR standard based APIs for patients to receive health information by 2021
- All data elements need to be exposed via API by 2021!
- Huge opportunity for third party developers
- Patients become stewards of their own health records!
HealthKit is a store of health and fitness data.

Ext. Wearables

Apps
e.g. sleep tracking

Sensors
pedometer, accelerometer; gyro; etc

CardinalKit
any iOS app
HealthKit is a store of health and fitness data.

CardinalKit any iOS app

Cloud Firestore

Google Cloud Healthcare API

this entire fitness data collection process can occur passively

ResearchKit is an open source framework introduced by Apple that allows researchers and developers to create powerful apps for medical research.

CareKit - developed with the goal of helping track the development of symptoms and adherence to medication over a period of time.
**Highlights**

- **Steps**
  You're taking more steps than you usually do by now.
  - Today: 4,028 steps
  - Average: 2,640 steps

- **Mindful Minutes**
  You averaged 10 mindful minutes over the last 7 days.
  - Average Minutes: 10 min
Attendance Check 👋🏼

- Use the following link to mark your attendance for today:
If we have time...

- Let’s explore some examples of other ResearchKit applications!

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Health and Medicine Apps Using ResearchKit and CareKit
Now, everybody can better manage their personal health and contribute to advances in medical research.

We developed ResearchKit and CareKit to empower you to take a more active role in your health, well-being, and the future of medicine. These apps, paired with the advanced technologies built into your iPhone, help you manage your medical conditions, symptoms, and medications, and collect the type of data that researchers are seeking.
Welcome to SleepHealth -- a Mobile App Study and Wellness tool from the American Sleep Apnea Association and powered by Apple.
Consent Walkthrough

The next few screens will explain the research study and help you decide whether or not you want to participate.

After the walkthrough, we’ll briefly test your understanding to make sure you know what is involved.

Get Started
MyGeneRank
Unlock your Genetic Risk

2.3 ★★★★★
25 Ratings

Age

Offers iPad App

Many conditions affecting our health are caused by a combination of our environment, our behaviors, and our genes. While we can all

3.1 ★★★★★
7 Ratings

Activities Completed

25%

Offers iPad App

MS Mosaic
Duke Health

17+

Age

Active Time (Minutes)

3.1 ★★★★★
7 Ratings

Activity: "MS MOSAIC"
A Multiple Sclerosis Research Study

Read Consent Document
Email Consent Document

Desire to preview?

Join Study

Activities

Dashboard

Offers iPad App

MS Mosaic is a Duke sponsored research study that seeks to better understand multiple sclerosis from daily experiences. Like you.

Activities

Dashboard

Offers iPad App

MS Mosaic is a Duke sponsored research study that seeks to better understand multiple sclerosis from daily experiences. Like you.
Thank you!
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