DEEP

OWN YOUR ATHLETE-NESS

Creating an Algorithm for Personalized Fitness Programming

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The State of Fitness Programming

Automation & personalization are everywhere.

Ok, almost everywhere.

Most coaches are still writing workouts and long-term fitness plans by hand. The result?

- Most workout plans are not personalized
- True personalized plans are expensive
- Creating fitness plans - general or personalized - is time consuming for trainers and coaches

The Problem

How can we make personalized programming accessible to everyone?

- Use technology to automate the creation and delivery

What does a viable computer-realizable solution look like?

- Remove the reliance on intuition and instinct
- Retain the feeling that a coach wrote the workouts

MATLAB has helped us do all of the above!

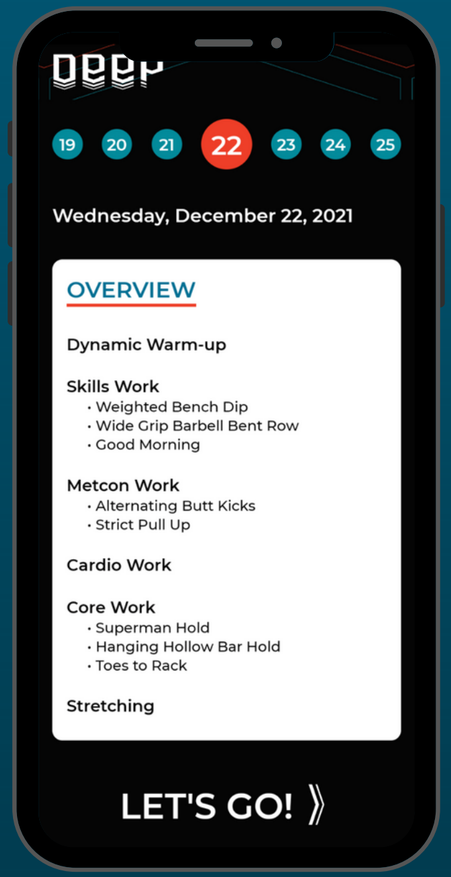
The Deep Athletics Team

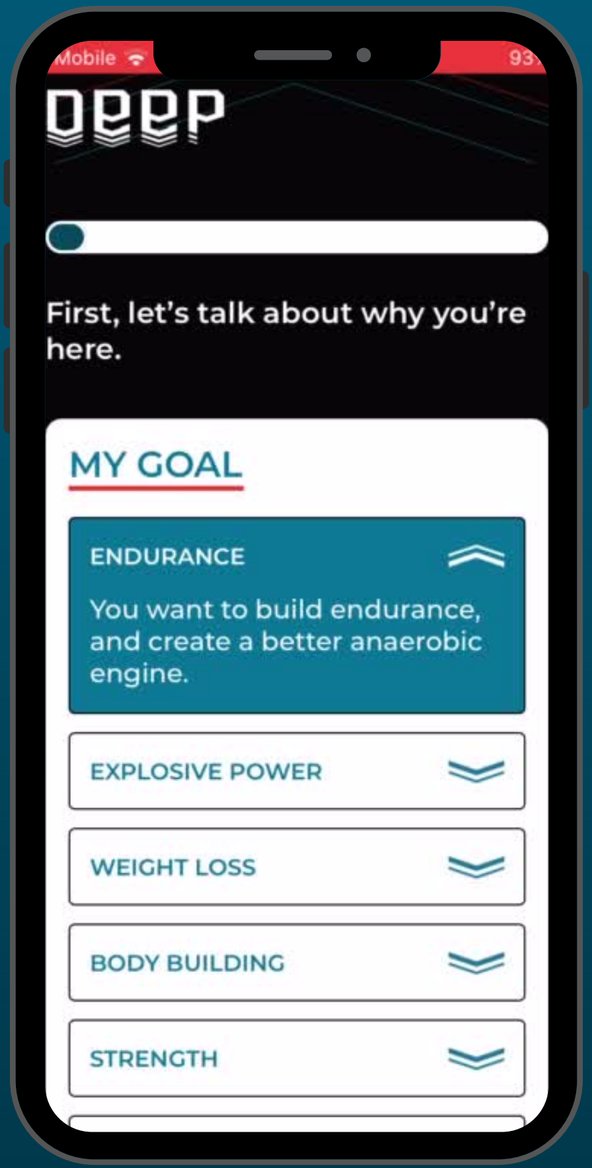
Founders

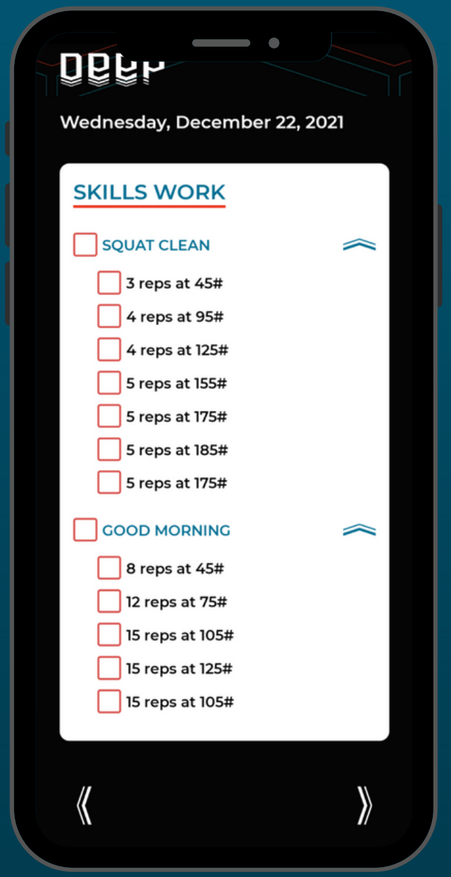
- Aaron Adams
  - Former US record holder in Olympic Weightlifting
  - 10+ years experience programming for both elite athletes and everyday worker-outers

- Dave Erickson
  - 20+ years experience in defense/aerospace industry
  - Extensive expertise in modeling, simulation, and building complex algorithms
  - Every-day worker-outer

The App


19 20 21 22 23 24 25
Wednesday, December 22, 2021
OVERVIEW
Dynamic Warm-up
Skills Work
· Weighted Bench Dip
· Wide Grip Barbell Bent Row
· Good Morning
Metcon Work
· Alternating Butt Kicks
· Strict Pull Up
Cardio Work
Core Work
· Superman Hold
· Hanging Hollow Bar Hold
· Toes to Rack
Stretching
LET'S GO!


First, let's talk about why you're here.
MY GOAL
ENDURANCE
You want to build endurance, and create a better anaerobic engine.
EXPLOSIVE POWER
WEIGHT LOSS
BODY BUILDING
STRENGTH


Wednesday, December 22, 2021
SKILLS WORK
SQUAT CLEAN
3 reps at 45#
4 reps at 95#
4 reps at 125#
5 reps at 155#
5 reps at 175#
5 reps at 185#
5 reps at 175#
GOOD MORNING
8 reps at 45#
12 reps at 75#
15 reps at 105#
15 reps at 125#
15 reps at 105#

The Deep Athletics Algorithm

What does the Deep Athletics algorithm do?

- Unique daily workouts
- Maintains periodization and progressive overload
- Avoids human-error mistakes
- Accounts for skill level, equipment, injuries and time commitments
- Very specific daily workouts, including
  - Warmup & stretching
  - Skills, metcons, cardio, & core
  - Reps, weights, & times

Inside The Algorithm

Personal Metrics

Goals & Time Commitment

Equipment Availability

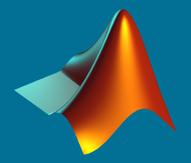
Layout Training Calendar

Select Daily Exercises

Define Movement Frequencies

Calculate Reps, Weights, Distances

Select Workout Scheme



Daily Workouts

Exercise Database

Training Goal Database

Workout Style Database

The Implementation Challenge

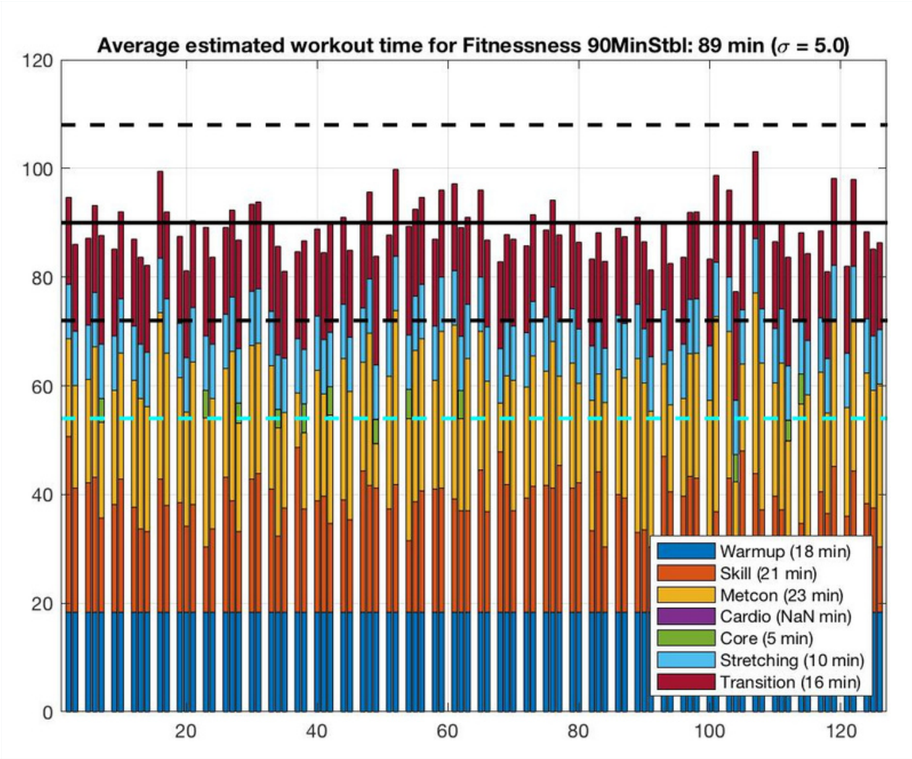
The inherently "human" nature of the problem presents unusual challenges that MATLAB is well-suited to handle

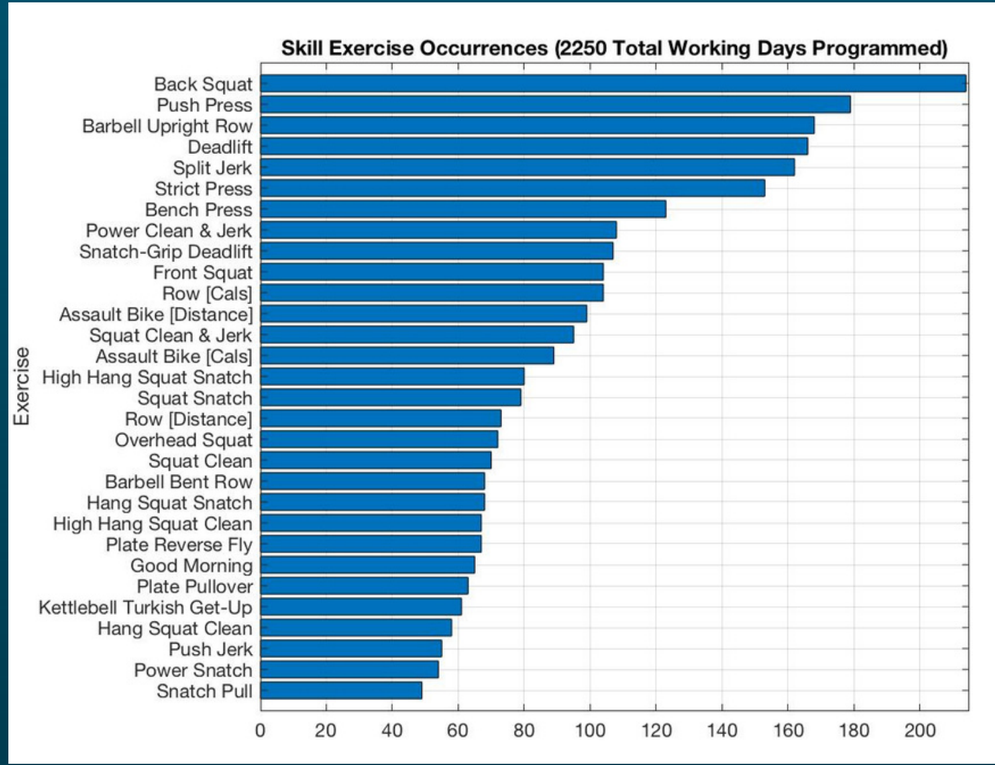
- Mixture of numerical and text-based variables throughout

- Large exercise database built in Excel spreadsheets
  - Easy for us to read and modify
  - Separate tool built to read and error check before saving as .MAT file for speed

- Significant randomness built into algorithm

Integrated Development, Testing & Analysis





MATLAB allows us to integrate testing & analysis into the algorithm

The Delivery Dilemma

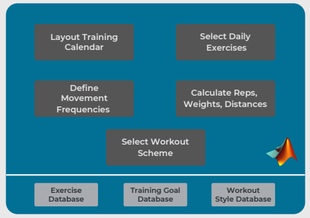
Once we determined the algorithm was feasible, the next question became how to deliver workouts to individuals.

- Given today's world, a phone app is the obvious choice

How can the algorithm interface with an app?

- Port the algorithm to an app-centric language
- Use MATLAB Coder to port to C/C++
- Use MATLAB Compiler SDK to build DLL
- Use MATLAB Production Server to host the algorithm

Delivering The Algorithm



Deep Athletics Algorithm Compiled to .NET DLL

.NET Wrapper

Azure

User Database

Send & Receive Data to Algorithm .NET Interface

Heroku

App Intake Form

Daily Workout Display

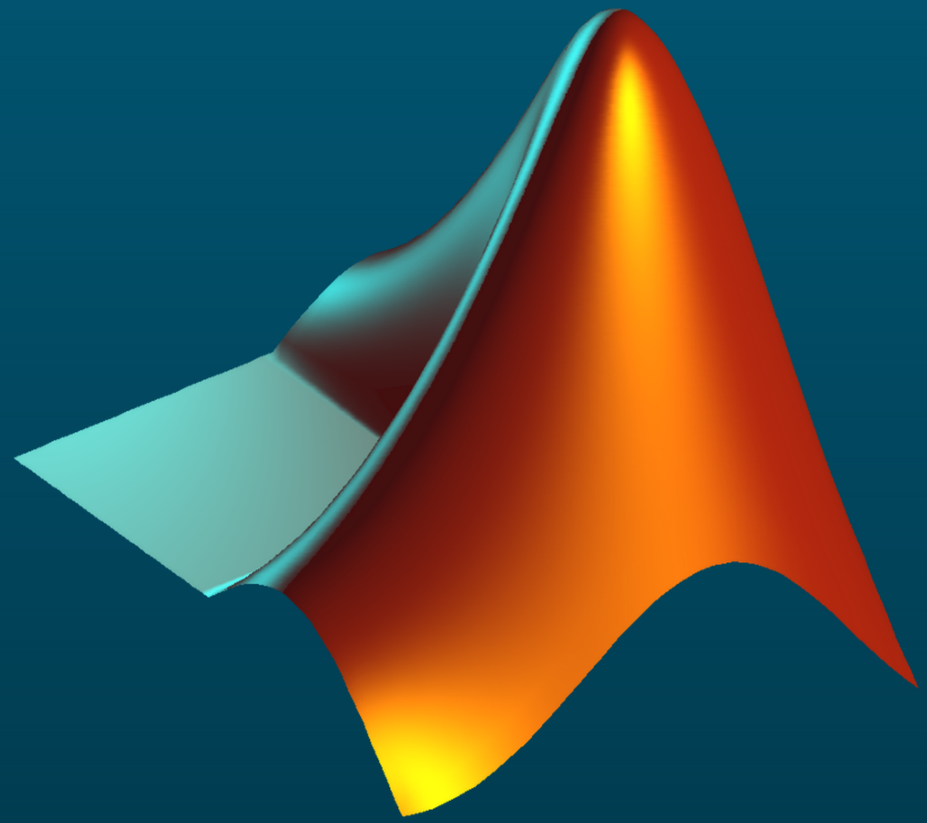
App on User's Phone

MATLAB Compiler SDK used to build .NET DLL

My Takeaway on MATLAB

The flexibility of the MATLAB "ecosystem" has significantly simplified our gestation

- Moved from concept development to deployment on the Apple and Android app stores without interruption
- Allows for integrated testing and analysis
- Saved significant money and time
- Remarkable customer support



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Thank you for your time & interest!

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Deep Athletics - Helping everyday worker-outers realize their Athlete-ness