Problem

- New health monitoring devices are disrupting the physical fitness space by providing user insights about their health, but these technologies require specialized wearables.
- Equipment placed on the body has limited access to external information and the users activities, therefore is unable to assist individuals to improve performing these activities.

Solution: Smart Environment

- Smart environments with infrastructure cameras enables detailed information collection about a users activities in a complete hands free manner.
- Gym Scribe tracks user’s workouts by processing live video footage using computer vision and neural networks to provide feedback via an application in real-time.

Architecture

- Video footage is captured using infrastructure cameras and sent to the nearby cloudlet using the Gabriel Client.
- Each frame received on the Gabriel proxy is passed to the Gym Scribe Classifier for processing, classification and notification.
- These cloudlets (powered with Nvidia Tesla’s K40 chip) classify the footage using Long term recurrent convolutional networks.
- The classification results are then sent to the user device via Google Cloud Messaging Services (GCM).

Real time classification of 5 different exercises

- Accuracy: ~65% among 5 different exercises
- Speed: ~0.5s to classify one batch of 16 images

Challenges

- Classification speed: Classifying video footage with neural networks required high complexity of the net to capture the temporal aspect
- Parsing desired information from the video footage using Computer Vision in a robust manner
- Providing meaningful feedback to the user due to the challenge of discerning information even when the classification is known

Future Work

- Train neural network for more exercises
- Improve speed and accuracy
- Personal Trainer: Gym Scribe can evolve to be a autonomous or semi-supervised personal trainer
  - Correct form
  - Advice additional repetition
  - Real-time workout recommendation about what exercise to do next

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