<table>
<thead>
<tr>
<th>Ashton Sopher</th>
<th>Ryan Davis</th>
<th>Andrew Xu</th>
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</thead>
<tbody>
<tr>
<td>University of Rochester</td>
<td>Rutgers University</td>
<td>Montville High School</td>
</tr>
<tr>
<td>Computer Science/ Mathematics</td>
<td>Computer Engineering / Computer Science</td>
<td>Interested in Mathematics and Computer Science</td>
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<tr>
<td>Class of 2021</td>
<td>Class of 2021</td>
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Motivation

● An efficient spectrum
  ○ Radio spectrum regulations
  ○ Wasted space
  ○ East coast study shows: “average total spectrum use of less than 10%” (Pickard)

● Characterizing transmitters
  ○ Security
  ○ Energy management
Our Project

- Goals
  - Create experiments to represent usage of the radio spectrum
  - Record experiment data and archive for later use
  - Predict the next state of the spectrum

- Applications
  - Efficient spectrum management
  - Classification of transmitters
  - Many more
Terminology

- Software Defined Radio (SDR)
- Universal Software Radio Peripheral (USRP)
- Orbit Nodes / Grid
- Node21-x
- WiFi Receiver / Transmitter
- LSTM (Long Short Term Memory) Neural Network
Topography

Node21-x

WiFi transmitters are variable

WiFi receiver
Experiments

- Recording basic activity
- Varying WiFi transmitter node position
  - 25 positions
- Varying file and bit rate
  - 3 bit rates (10, 30, 50 mbps)
  - 4 binary files
    (all 0s, all 1s, alternating 01s, random)
Automation

Master

External Storage

WiFi Device (Rx)

WiFi Device (Tx)

USRP

Node

USRP

Node

USRP

Node

USRP

Node

USRP

Node

USRP

Node

USRP

Node
LSTM

- Predicting the spectrum
- Synthetic data
- Future plans
Issues

- Operating the USRPs
- Getting every node to cooperate
- Time synchronization
- LSTM neural network
References

