Ubiquitous and Mobile Computing
CS 403x: *My Smart Phone Knows I am Hungry*
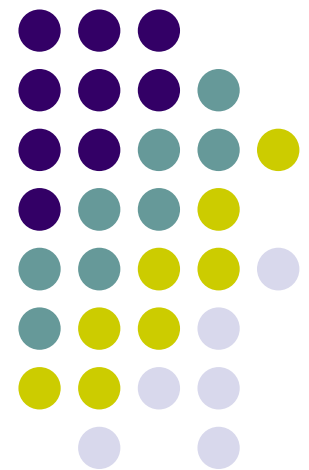
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The Problem

- Students making unhealthy eating choices in college

The Vision

- Just-in-time notifications
- Location services and learning
- No user input!

Related Work

- Apps with Notifications based on body sensor data

- Health feedback apps based on user input

Collecting the Data (Behavior)

- 25 Dartmouth college students for 10 weeks
- Activities and motion
- 10 minute activity periods
- Conversation frequency
- Wi-Fi building location
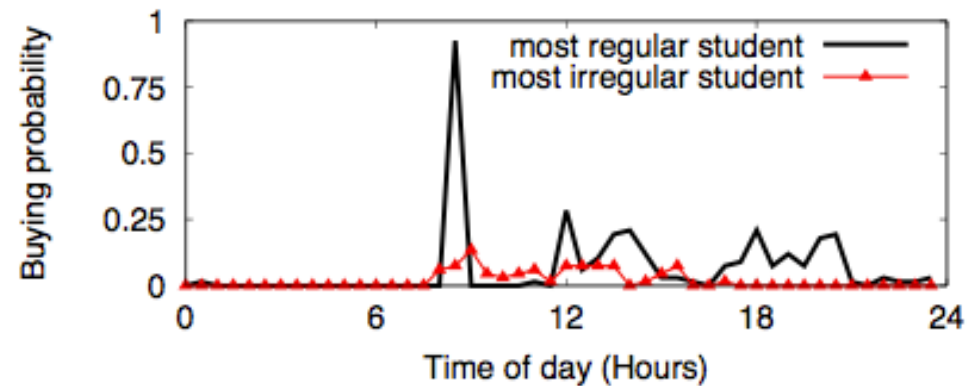
Collecting the Data (Purchases)

- Students use Dartmouth cards

- Location, cost, and time

- 2.81 purchases per day on average

Predicting the Future (Problems)

- Multipurpose buildings do more than serve food
- Students just passing through
- Mealtimes from 7:30-10:30, 11:00-3:00, 5:00-8:30
- Irregular eating

schedules

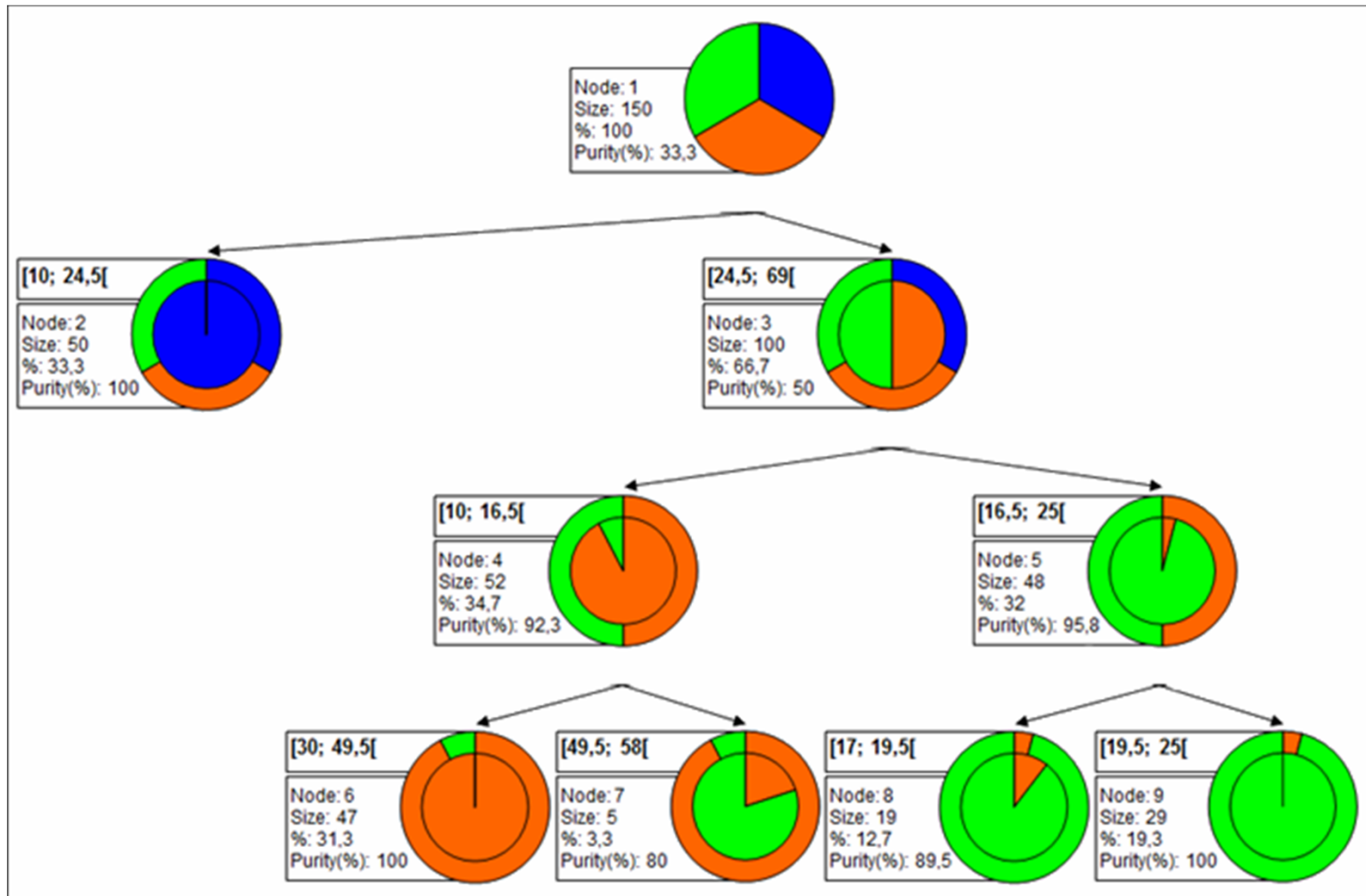# Predicting the Future (Approach)

- Collect training data

- Train the prediction model

- Turn into binary classification problem (will the user eat now or not?)

- Previous state features
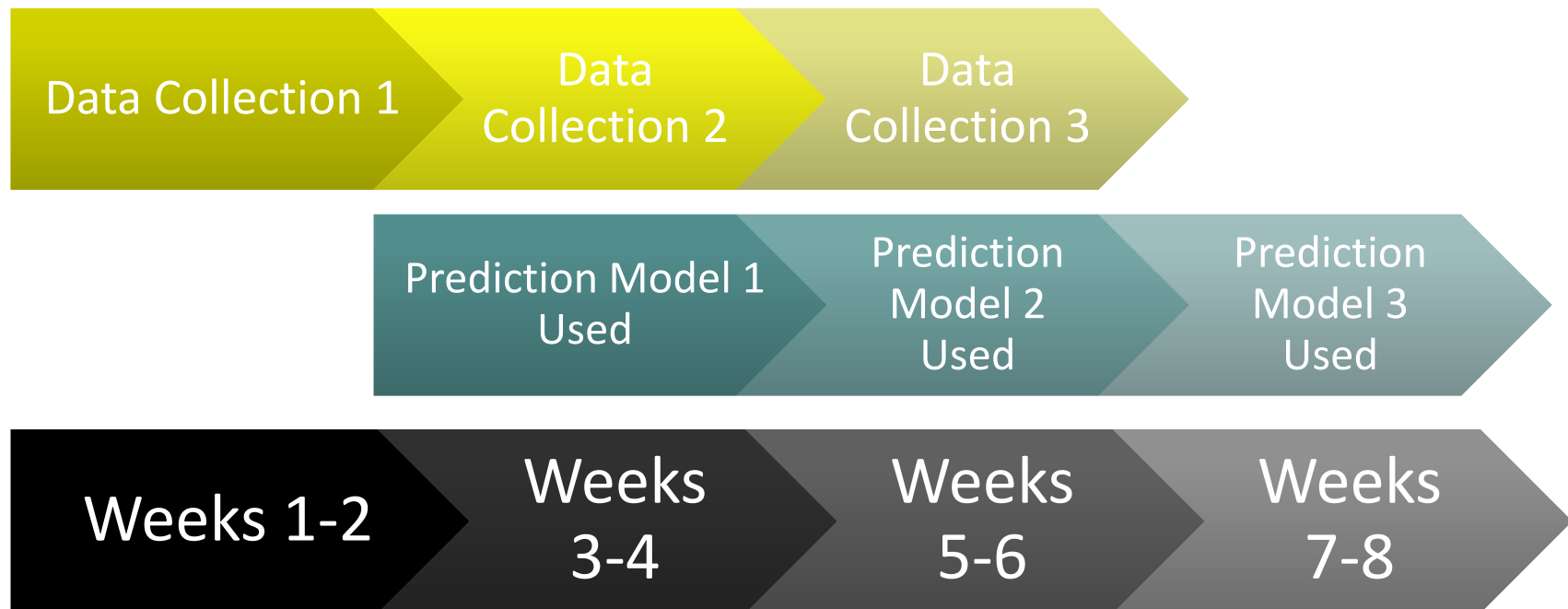
Classification and Regression Trees

- Prediction model built off of training data.
- Using Gini as an impurity measure

Adaptation and Learning

- Data collection period
- Training period
- 2nd collection period for adapted model

Data Collection 1	Data Collection 2	Data Collection 3
	Prediction Model 1 Used	Prediction Model 2 Used	Prediction Model 3 Used
Weeks 1-2	Weeks 3-4	Weeks 5-6	Weeks 7-8

Performance

- Accuracy : correct answers / total answers

$(tp + tn) / (tp + tn + fp + fn)$

- Precision : how often a positive label is correct

$tp / (tp + fp)$

- Recall : how well a positive case can be identified

$tp / (tp + fn)$

	Classified as Positive	Classified as Negative
Real value is Positive	True Positive (tp)	False Positive (fp)
Real value is Negative	False Positive (fp)	True Negative (tn)

Results with 10-fold cross validation

	Accuracy	Precision	Recall
Prediction Baseline	50.0%	26.6%	50.4%
Generic Model	68.6%	42.1%	49.3%
Personalized Model without Adaptation	73.9%	49.5%	53.6%
Personalized Model without Adaptation <= 3 Weeks	74.2%	52.7%	55.1%
Personalized Model without Adaptation 4-5 Weeks	73.8%	48.9%	52.1%

After Thoughts

- Used purchase data and building wifi location information

- No user input may not be plausible

- Different models each day

- Privacy issues with constant location tracking

Conclusion

- Have a well timed notification system

Future Work

- Notification content?

- Expand to other colleges and maybe the work force

- Figure out a way to record food purchases automatically (like with credit cards)

References

- Fanglin Chen, Rui Wang, Xia Zhou, Andrew T. Campbell. "My Smartphone Knows I am Hungry". Dartmouth College. Web. *http://www.cs.dartmouth.edu/~xia/papers/wpa14.pdf*

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