

HOW BUSY ARE YOU

Predicting the interruptibility Intensity of Mobile Users



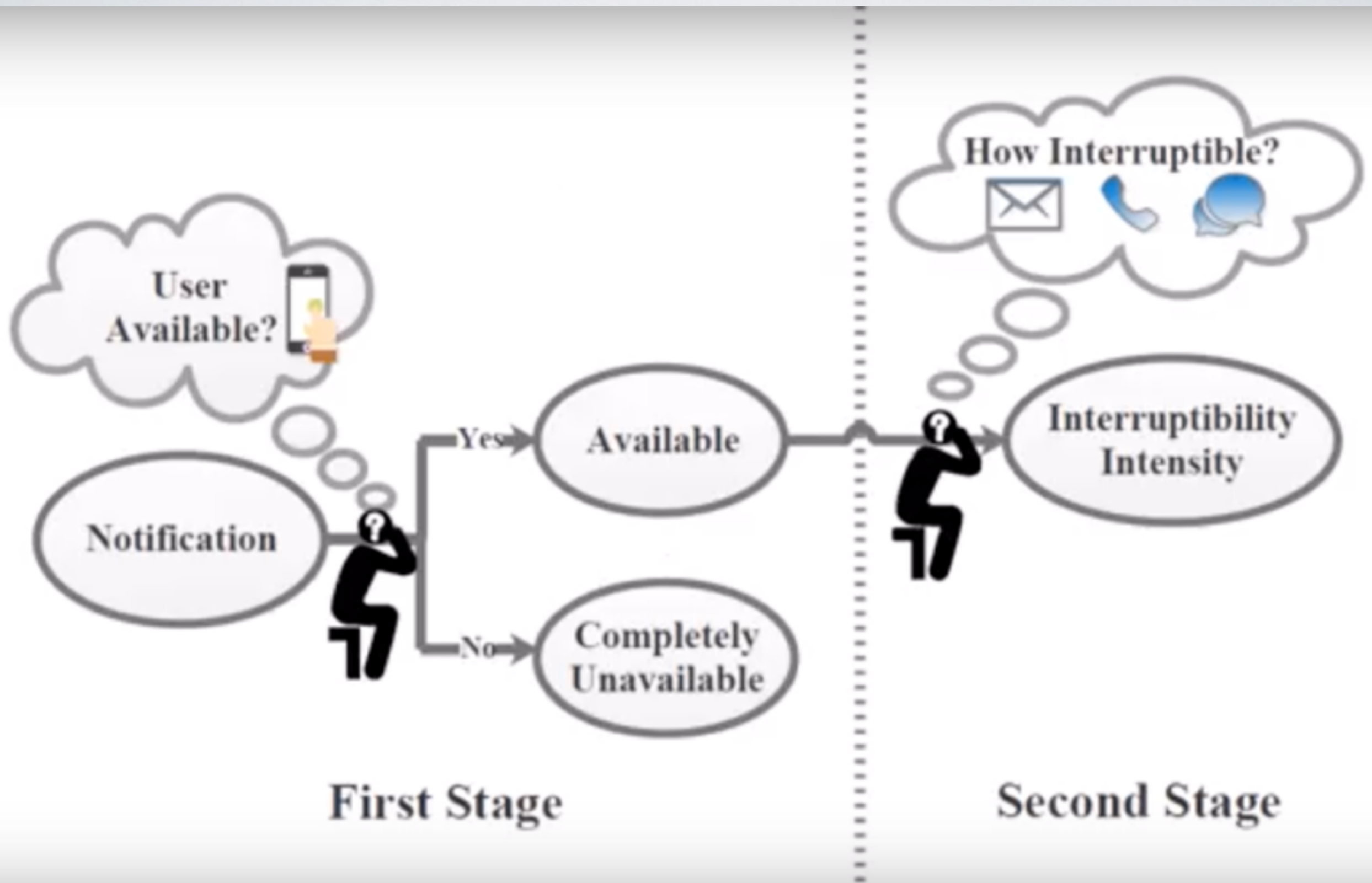
MOTIVATION

- Smartphones **frequently** notify users about newly available messages or other notifications.
- Inappropriate interruptions not only **annoy users**, but also **decrease their productivity** [65] and affect their **emotions** and social attribution [1].

BACKGROUND

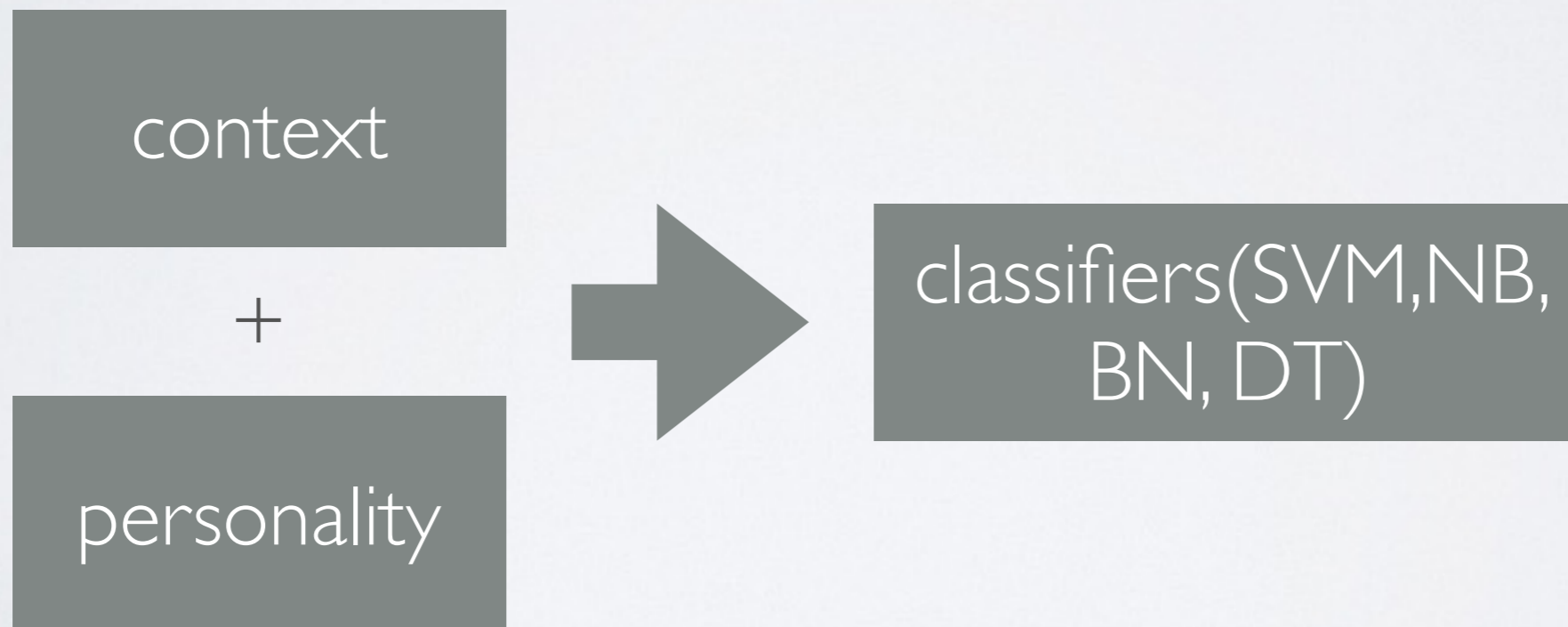
- so much related work about **Interruptibility**
Prediction...
 - Desktops notifications: sensors in lab or office
 - Phone calls - ring mode off/on
 - Mobile notifications - sitting/walking, activities,

METHOD



FIRST STAGE

- context Information: day, time, location, previous state, current state
- personality traits: extroversion, agreeableness, openness, conscientiousness and neuroticism

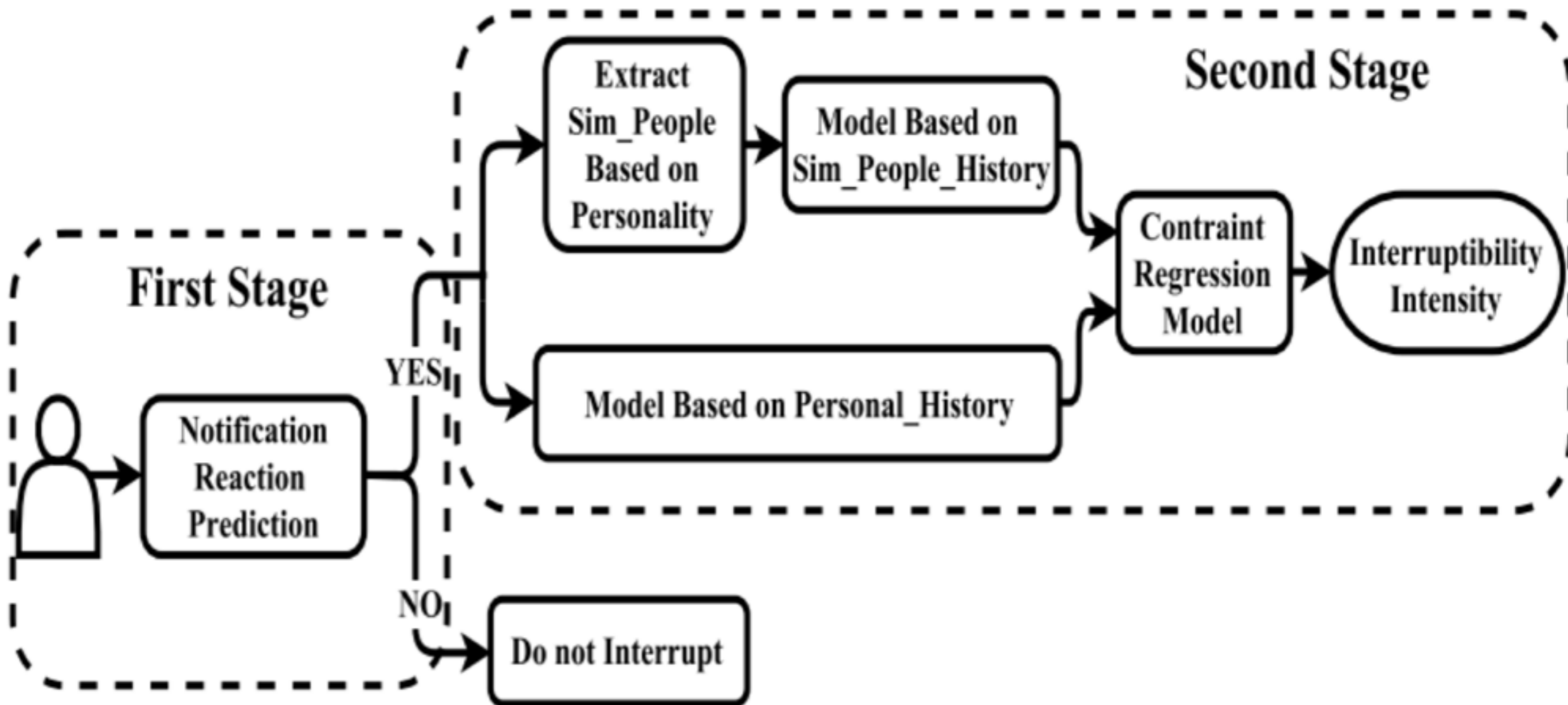


SECOND STAGE

- context \oplus : poi, mood, transportation, current activity, [tasks],
Interruptibility level
- personality traits: k-nearest-neighbors to find similar users

$$\begin{aligned} \textit{Interruptibility_intensity} &= \omega_1 f(\textit{Sim_People_Data}) \\ &\quad + \omega_2 f(\textit{Personal_Data}) \quad (1) \\ \text{s.t. } \omega_1 + \omega_2 &= 1, \omega_1 \geq 0, \omega_2 \geq 0 \end{aligned}$$

METHOD



EXPERIMENTS

- 22 / 33 participants
- personality test
- EMA survey APP

Data Type	Description
Time ^{*,+}	Survey pop-up time, reaction time and survey completion time.
Current and previous state ^{*,+}	In vehicle, on bicycle, running, still, tilting, unknown, walking.
Location ^{*,+}	Latitude and longitude, Foursquare checkins grouped into 10 categories.
Personality traits ^{*,+}	Extroversion, agreeableness, conscientiousness, neuroticism and openness.
Mood ⁺	Using BMIS survey, scaled from unpleasant to pleasant.
Transportation method ⁺	By car, by air, by bike, by bus, by train, by subway, by boat, running, walking.
Current activity ⁺	Doing exercise, having a meal, on the phone, playing games, studying, taking a rest, talking, watching video, working, writing/checking emails, bored, others.
Who would you like to do a task for (task sender)? (Select one or more) ⁺	1) Immediate family members 2) Extended family members 3) People you are close to 4) People you live with 5) People you work with 6) People you do hobbies/activities with 7) Strangers [78]
What type of tasks would you like to do? (Select one or more) ⁺	Educational activities, help colleagues, help family members, help strangers, household activities, leisure and sports, organizational, civic, and religious activities, phone calls and mails, purchase goods, others (Time Use Survey [58]).
Preferred task duration (slider) ⁺	1 minute to 120 minutes [58]
Interruptibility level ⁺	1) Highly interruptible 2) Interruptible 3) Neutral 4) Uninterruptible 5) Highly uninterruptible).

RESULT: Statical Inference

- The more pleasant, the more interruptible
- Interruptibility Differs at Different Places
- Interruptibility Differs with Different Activities
- Personal Relations Influence Interruptibility
- Short Interruptions Make People More Interruptible

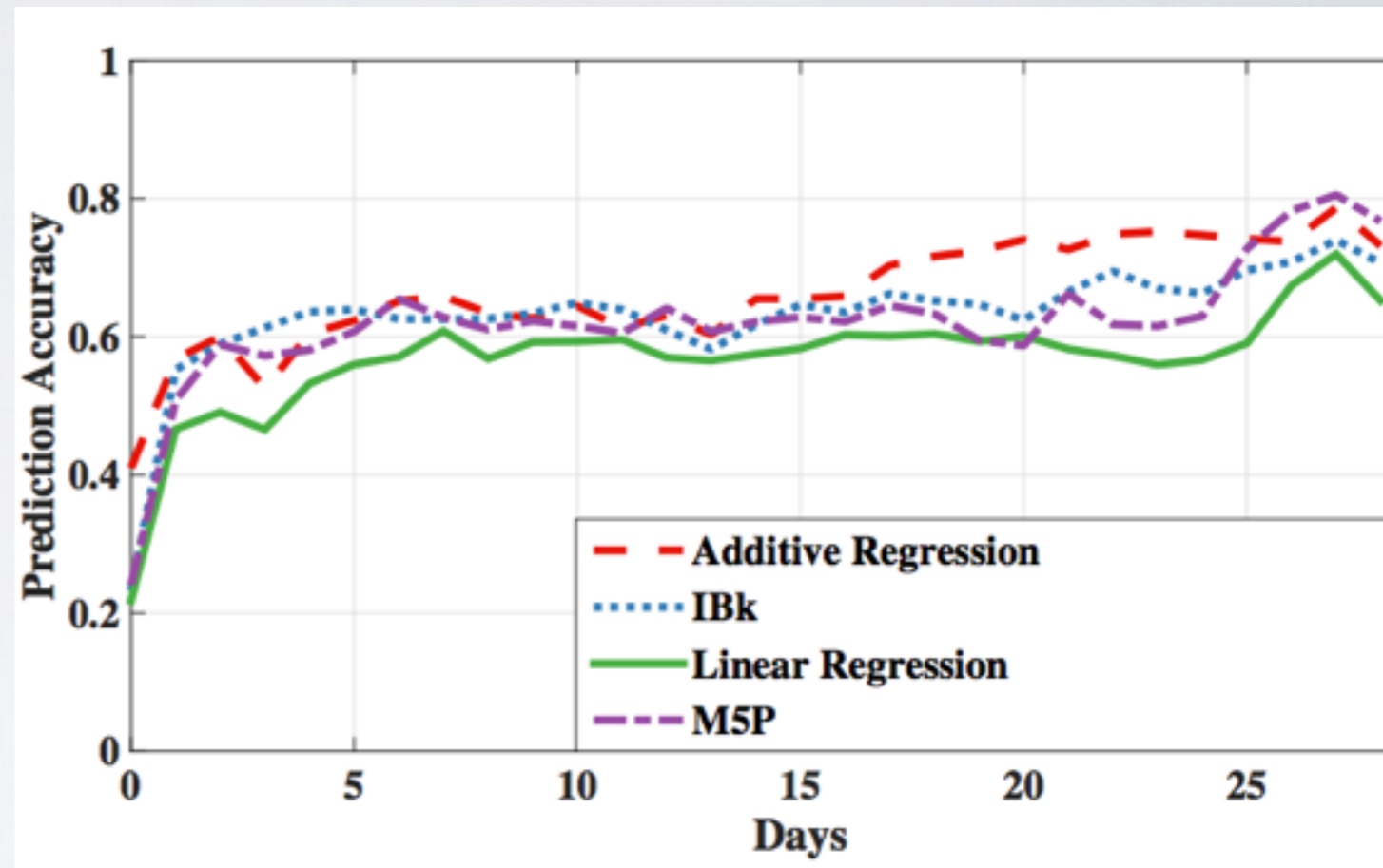
RESULT: Prediction Evaluation I

- SVM and Decision Tree outperform the others
- using personality increase accuracy by 10%

Classifier	Accuracy	Precision	Recall	F-Measure
Naive Bayes	0.66*	0.66*	0.69*	0.68*
	0.58	0.59	0.64	0.61
Bayesian Net	0.72*	0.73*	0.73*	0.73*
	0.58	0.59	0.64	0.62
SVM	0.75*	0.75*	0.78*	0.76*
	0.60	0.61	0.59	0.60
Decision Tree	0.75*	0.76*	0.76*	0.76*
	0.60	0.60	0.60	0.56
Baseline	0.56*	0.31*	0.56*	0.40*
	0.56	0.31	0.56	0.40

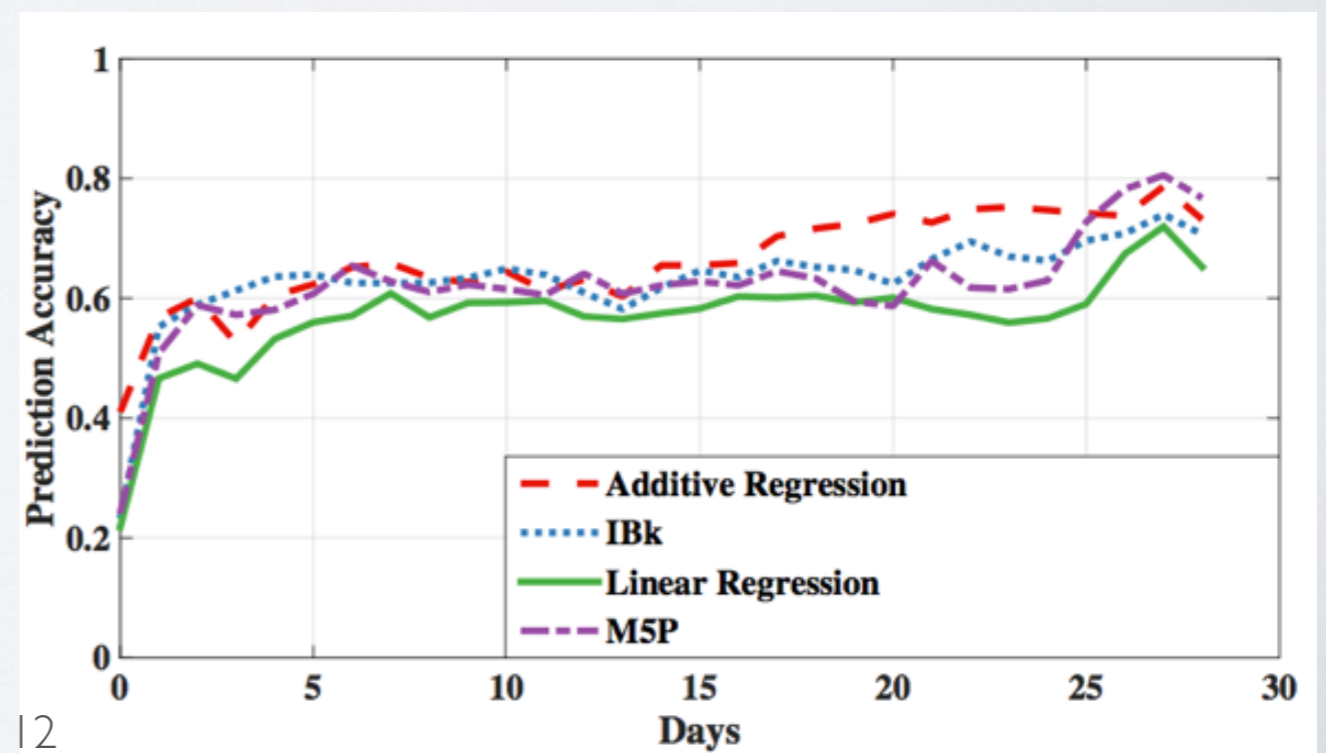
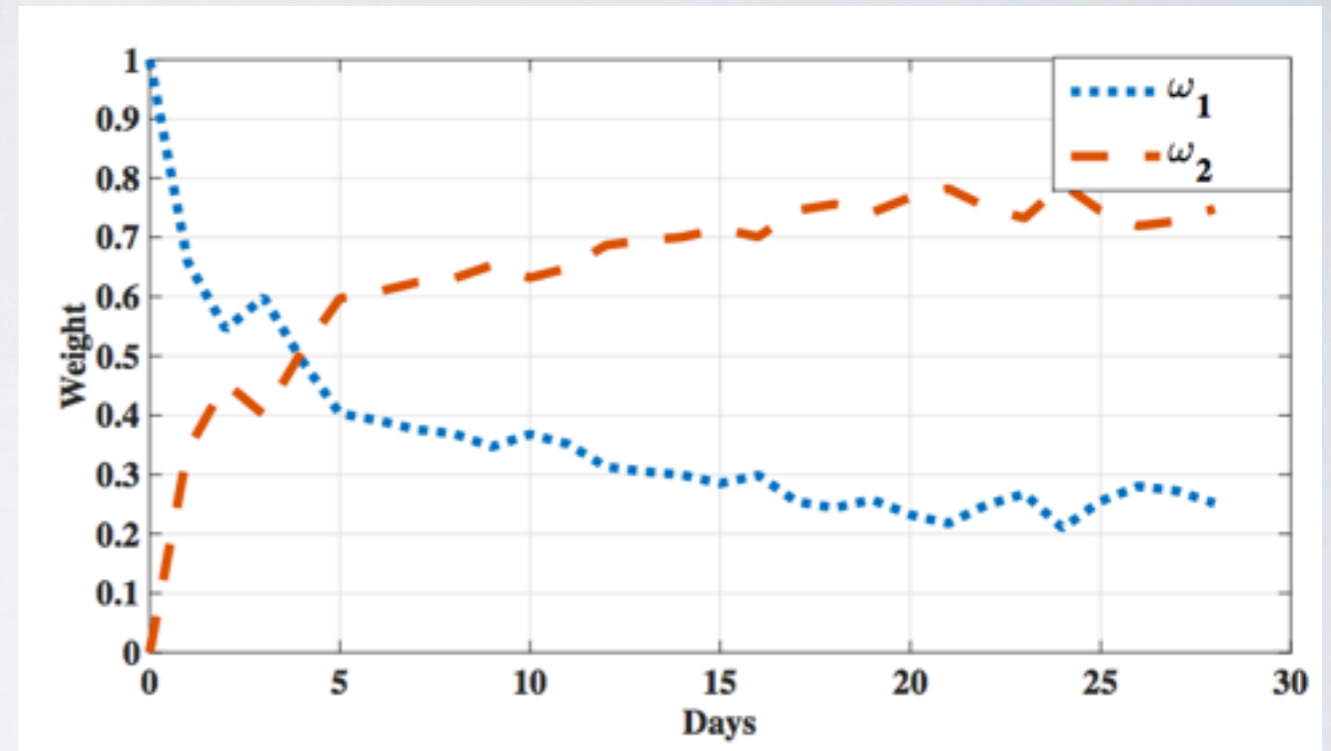
RESULT: Prediction Evaluation II

- additive regression performs the best with an average accuracy of 67.2%
- achieves best prediction accuracy 41.0% for the initial prediction



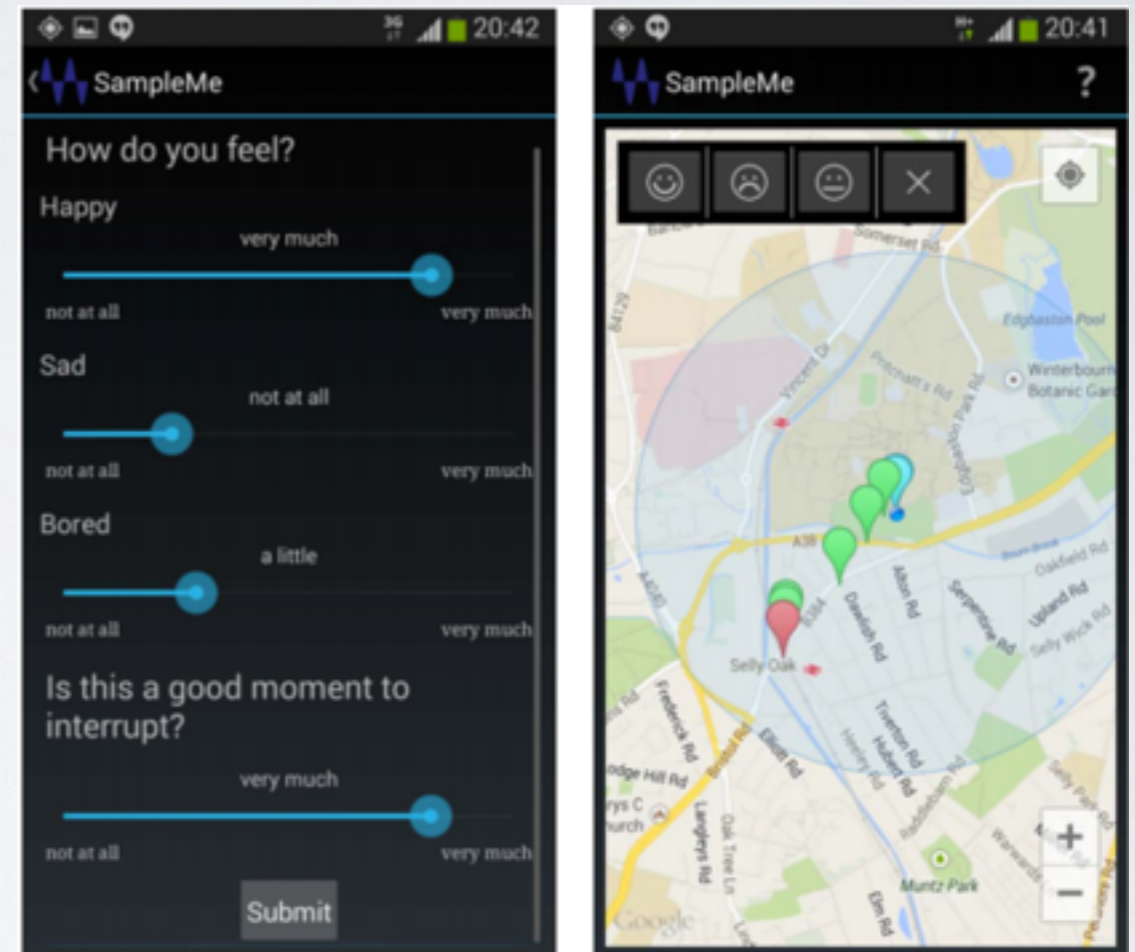
RESULT: Prediction Evaluation II

- The weight of sim_person and personal stabilize around 0.25 and 0.75
- additive regression performs the best with an average accuracy of 67.2%
- achieves best prediction accuracy 41.0% for the initial prediction



InterruptMe: designing intelligent prompting mechanisms for pervasive applications

- Ubicomp 14



Interruptibility of Software Developers and its Prediction Using Psycho-Physiological Sensors

- CHI'15



**dy setup for one participant wearing the
the field study. The tablet for triggering in
ft) to the participant's main screen.**

Designing Content-Driven Intelligent Notification Mechanisms for Mobile Applications

- Ubicomp 15

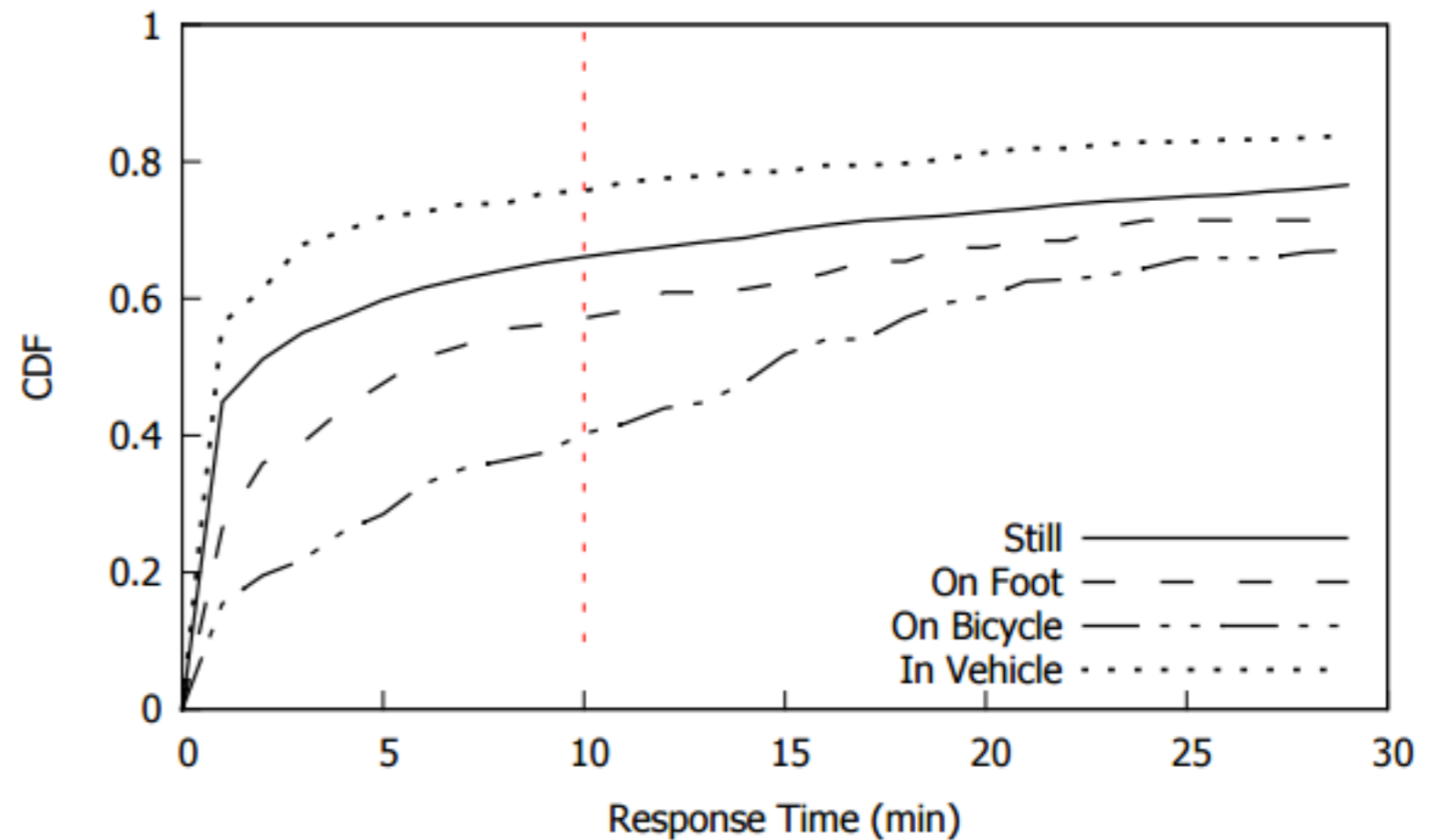


Figure 4. CDF of response time for notifications received while performing different activities.

My Phone and Me: Understanding People's Receptivity to Mobile Notifications

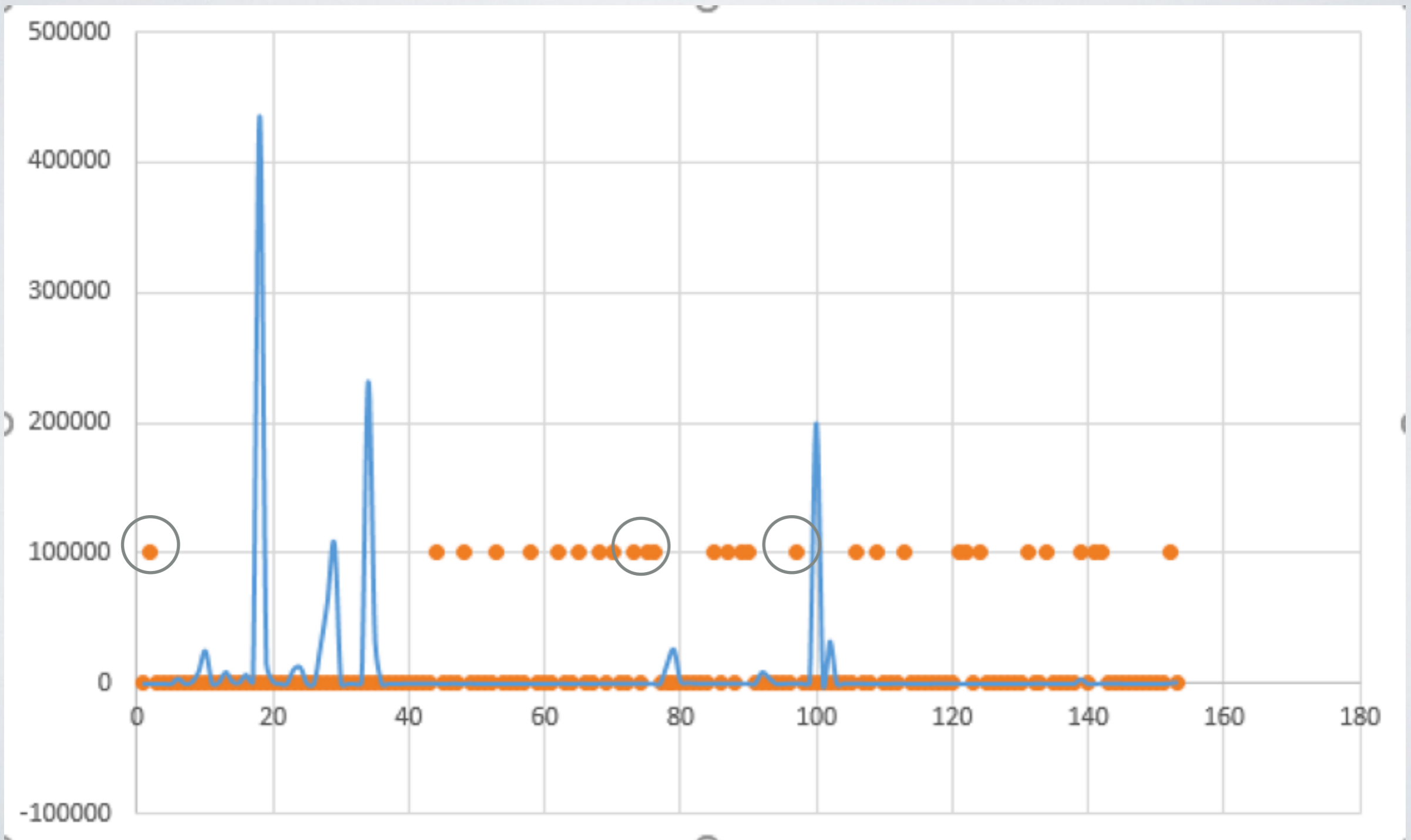
- CHI'16

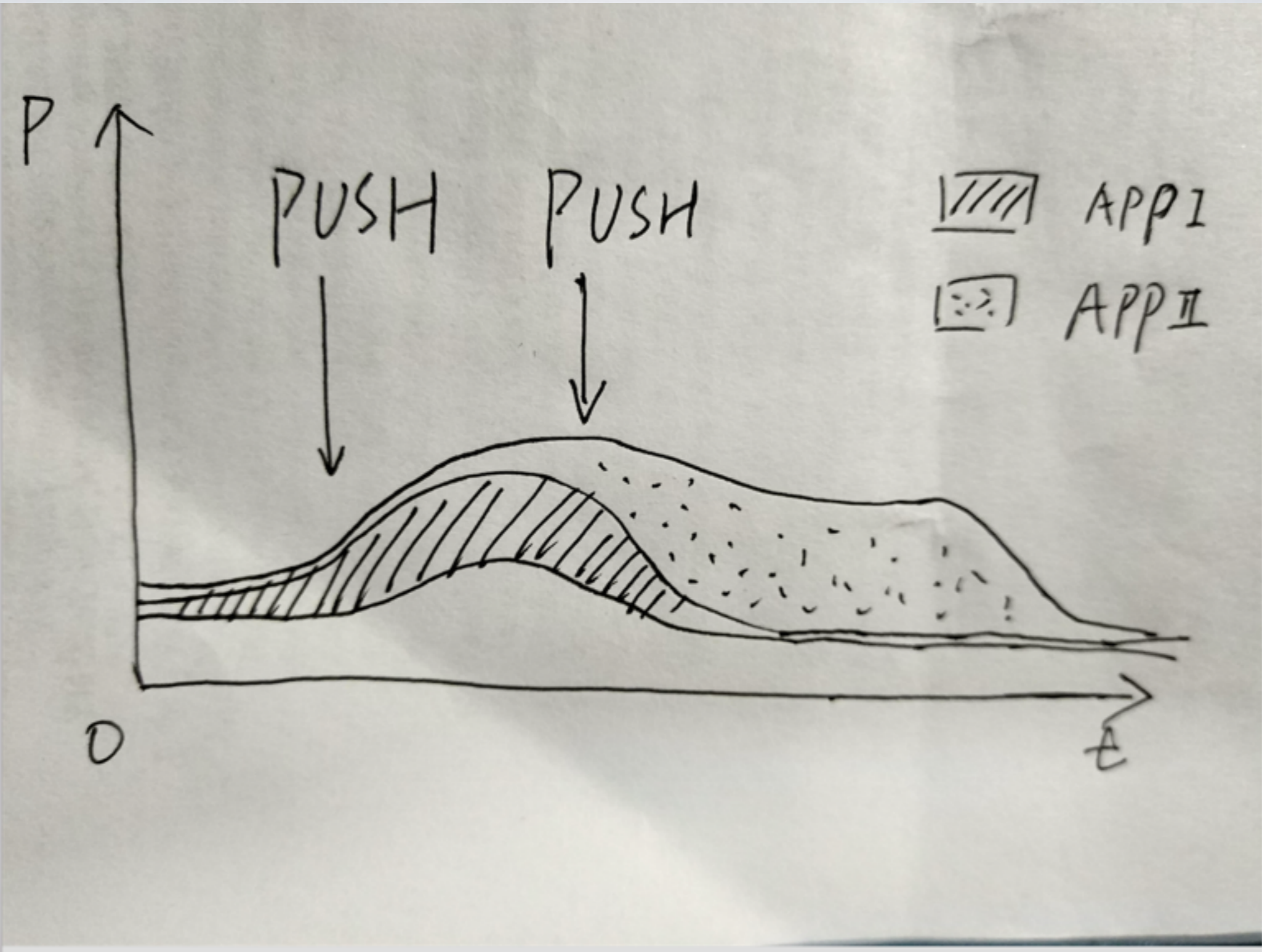


Did you notice the alert (e.g., vibration, sound, flashing LED) for this notification when it first arrived?	(i) Yes, and I decided to check my phone immediately. (ii) Yes, but I was already using my phone. (iii) Yes, but I ignored the alert. (iv) No, I didn't notice the alert.
How did you handle the notification when you first saw it?	(i) I decided to immediately click it. (ii) I decided to dismiss it because it didn't require any further action. (iii) I decided to dismiss it because it was not relevant or useful. (iv) I decided to return to it later. (v) Other (descriptive).
Select all factors that made you decide to click/dismiss the notification.	(i) The sender is important. (ii) The content is important. (iii) The content is urgent. (iv) The content is useful. (v) I was waiting for this notification. (vi) The action demanded by the sender does not require a lot of effort. (vii) At this moment, I was free. (viii) Other (descriptive).
What best describes your relationship to the sender?	(i) Partner (ii) Immediate family (children, parents) (iii) Extended family (nieces/nephews, cousins, aunts/uncles) (iv) Friend (v) Acquaintance (vi) Superior at work (vii) Colleague (viii) Subordinate at work (ix) Client (x) Service provider (xi) Sender is not a person (xii) Other relationship (descriptive).
Please describe what the notification was about.	Descriptive response.
Please describe what activity you were involved with when you received the notification.	Descriptive response.
When the notification arrived I was:	(i) Starting a new task/activity. (ii) In the middle of a task/activity. (iii) Finishing a

MY OPINION

- common topic but new to me (us ?)
- use similarity to improve accuracy and deal with initial problem
- number of Participants is small
- not convenient in practice







有没有在自己比较忙或者不想被打扰的时候，被手机应用推送消息打扰过？ (必填, 单选)

选项 ↑

数据量 百分比

经常 **逻辑条件**

7 43.75%

偶尔 **逻辑条件**

7 43.75%

从未

2 12.5%

回答 **16** (100%)



如果被打扰了，你会怎么做呢？ (必填, 多选, 至少选择1项, 最多选择3项)

被关联条件

选项 ↑

数据量 百分比

依赖性不强的应用直接卸载了

3 21.43%

取消应用的推送权限

10 71.43%

关闭推送提示音

4 28.57%

提醒自己下次在不希望被打扰的时候关闭提示音

1 7.14%

不理它，响去吧！

3 21.43%

虽然不情愿但是因为强迫症所以还是看一眼发生了什么

6 42.86%

回答 **14** (87.5%)

跳过 **2** (12.5%)



如果一条推送消息（非紧要的）没有被及时处理，之后再看到它会特意打开相应应用处理它么。 (必填, 单选) **被关联条件**

选项 ↑	数据量	百分比
一定会	2	14.29%
经常会	4	28.57%
偶尔会	4	28.57%
很少会	4	28.57%
直接忽略它	0	0%

回答 **14** (87.5%)
跳过 2 (12.5%)



如果很多应用推送堆在一起，你会怎么处理呢（处理指的是通过点击该推送打开应用）

(必填, 单选) **被关联条件**

选项 ↑

数据量 百分比

全部无视掉

4 28.57%

处理很少部分，只看最要紧的/感兴趣的

6 **42.86%**

处理大部分

3 21.43%

查看所有

▼ 筛选

1 7.14%

回答 **14** (87.5%)
跳过 2 (12.5%)



如果看到了一条不想响应（响应指的是点开APP）的推送，你更倾向于 (必填, 单选)

被关联条件

选项 ↑

数据量 百分比

既然已经打开了手机，不如随便看看别的

9
64.29%

直接放下手机，继续工作或者原来做的事情

5 35.71%

回答 **14** (87.5%)
跳过 2 (12.5%)