
UbiTtention 2019: 4th International Workshop on Smart & Ambient Notification and Attention Management



Figure 1: This alarm clock uses ambient light to softly wake up its user. We envision that it could also be used as an helpful output device for other information, e.g., incoming phone calls or reminders.

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Figure 2: Audience at the UbiTention '18 workshop at UbiComp '18 in Singapore.



Figure 3: Discussion at the UbiTention '17 workshop at UbiComp '17 in Maui.

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ABSTRACT

Users are increasingly being confronted with a tremendous amount of information proactively provided via notifications from versatile applications and services, through multiple devices and screens in their environment ubiquitously. However, human attention is limited. Further, the latest computing trends including versatile IoT devices, and contexts, such as smart cities and vehicles, are further competing for limited attention. To counter this challenge, “attention management”, including attention representation, sensing, prediction, analysis, and adaptive behavior is needed in our computing systems. Following the successful UbiTention 2016, 2017 and 2018 workshops with up to 50 participants, the UbiTention 2019 workshop brings together researchers and practitioners from academia and industry to explore the management of human attention and notifications across versatile devices and contexts to overcome information overload and overchoice.

CCS CONCEPTS

• **Human computer interaction (HCI);** • **Ubiquitous computing;**

KEYWORDS

Notifications, Attention Management, Ambient Interfaces, Smart Cities, Internet of Things, Interruption Management

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BACKGROUND

Many ubiquitous devices and services are proactively seeking our attention through *notifications*: visual, auditory, or tactile alerts intended to draw attention to events that took place outside of a user’s focus [7]. However, notifications are rapidly becoming integral to many ubiquitous computing platforms, such as smartphones, desktop computers, cars, and are being used via multiple applications and services [16, 18].

Table 1: Overview of workshop topics.

- (1) Detection/prediction of users' status around attention and notifications, such as availability, interruptibility, attentional status and cognitive load
- (2) Exchange/share data, analysis and feedback on capabilities beyond detection and prediction
- (3) Versatile types of information presentation methods including ambient, peripheral, distributed and multi-modal presentation
- (4) Infrastructures, frameworks and tools for the development of smart attention systems
- (5) Strategies for attention management against emerging computing technologies, including IoT devices
- (6) Understanding users' behavior and habits around notifications and interruption, including longer term "user engagement" and "behavior change"
- (7) Use of ambient representations for "big-data analysis"
- (8) Management of information overload in various emerging computing venues such as smart city and smart mobility

¹<http://mhci15.smarttention.com/>

²<http://mhci16.smarttention.com/>

³<https://www.ubittention.org/2016/>

⁴<https://www.ubittention.org/2017/>

⁵<https://www.ubittention.org/2018/>

Research in different contexts has repeatedly shown that notifications can be distracting, which may cause negative effects on task performance [2, 4, 6, 7, 9, 17]. Since notifications in daily life are often created due to communication platforms [3, 5, 13, 16], social expectations towards responsiveness create pressure to attend notifications timely. Consequently, disabling notifications, despite their known disadvantages, for many people is not an option [5, 7, 9].

Yet, it becomes increasingly exhausting to pay attention and respond to all these interruptions in timely and appropriate ways, especially in the advancing ubiquitous computing world with emerging contexts, such as IoT, smart cities and smart vehicles. As a consequence, users might miss crucial information and become less efficient [5] or, in case of a missed personal message, appear rude [14]. In addition, presence of multiple applications/services makes it harder to choose the best option to respond with, which may lead to stress and frustration. Eventually, this leads to the problems of *information overload* and *overchoice*—in our opinion two of the most relevant problems in information technology for the next few decades. In the era of the Internet of Things (IoT) we have to handle incoming notifications from all "our" devices as well as "other" devices. Together with developments in smart city environments or with smart mobility, the information overload is expected to grow.

Recently, we have been seeing an increase in novel attempts to address these problems by using contextual data in order to deliver notifications at more opportune moments [6, 8, 10–12, 15], the use of ambient information presentation (see Figure 1) or using augmentation, or by making it easier to deal with interruptions [1]. However, there are significant challenges still remaining to bring these works together and apply the right strategy at the right moment.

UBITTENTION 2019 WORKSHOP

In this workshop, we will bring together people from industry and academia who are active in the areas of attention research, context-aware and ubiquitous computing, and ambient and multi-modal interaction. The main objective of UbiTtention 2019 is to share the latest research on user attention and notification management in several research areas and contexts, including HCI, systems research, user studies, IoT, smart cities, smart homes and smart vehicles (as shown in Table 1). Further, this workshop aims to identify future research challenges, research opportunities, and applications of our research outcomes to society.

This workshop is a follow-on from the successful *Smarttention, Please!* workshops at MobileHCI 2015¹ and 2016², and the *UbiTtention* workshops at UbiComp 2016³, 2017⁴ and 2018⁵ (cf. Figures 2 and 3). Last year, the UbiTtention workshop received 12 innovative papers and more than 35 participants on the venue of UbiComp 2018. While the Smarttention workshops focused more on mobile notifications, the subsequent UbiTtention workshops focus on a larger understanding of the different roles notifications can play in a wide variety of computing environments including the office, the home, in cars, and other smart environments.

Table 2: The workshop will be a mixture of inspirational talks, creative group discussions, and a summative wrap-up session.

09:00–09:10	Introductions
09:10–10:00	Keynote Lecture
10:00–10:30	Coffee Break
10:30–12:00	Presentation Session
12:00–13:00	Lunch Break
13:00–14:30	Break-out Discussions
14:30–15:00	Coffee Break
15:00–16:30	Discussion of Group Findings
16:30–17:00	Wrap-up Session & Plan of Future Actions
18:30–20:00	Workshop Dinner

Relevance and impact to UbiComp: We are facing a “ubiquity” of computing with increasing types of computing devices (including IoT), services, and computing venues (home, office, cities, vehicles). UbiTtention’s focus on user attention and notifications is related to all of the ubicomp research fields above, and has significant potential to impact and contribute to all such areas horizontally.

Long-term objectives: The workshop will lead to a deeper understanding of notifications and attention management. We plan to build an active and long-lasting community around the workshop’s theme. For example, we want to use the workshop’s drive to prepare an open call for a special issue of a journal, e.g., IEEE Pervasive. We also aim to consolidate the findings from the workshop in an article that highlights the main insights, in a suitable venue like ACM Interactions.

A central component to disseminate the gained insights will be the workshop’s website. We will use this website to present all individual workshop contributions as well as the results of the discussions. Also, our Facebook page will be used to distribute information, so researchers including prospective authors and participants can join together.

WORKSHOP PAPERS

Our workshop will ask for papers outlining new insights in the topics listed in Table 1. The papers are written in the ACM Extended Abstract format with a length of 4 to 6 pages and are to be included in the ACM Digital Library. Call for papers will be sent to all relevant mailing lists of several research communities, including those of ubicomp research, HCI, mobile interaction, as well as the IoT, smart city, smart home, and smart vehicle communities. Further, the call will be distributed to participants of the previous *Smarttention* and *UbiTtention* workshops. Finally, information will also be shared on the workshop website and Facebook page. We aim for a selection of 10-15 workshop papers. Submissions will be peer-reviewed by at least two reviewers from an international PC of renowned researchers and experts. The acceptance criteria will be a mixture of relevance, novelty, writing, research quality, and provocativeness. With the aforementioned measures, we are confident to attract a large number of submissions, which will allow us to assemble a high-quality workshop.

WORKSHOP STRUCTURE

We plan UbiTtention 2019 as a full-day workshop, aiming to bring together practitioners and academics. After introductions and an inspiring keynote talk, we will have a series of informative paper presentations. In the afternoon we will have an extensive discussion phase about several topics, to be identified by the organizers based on the workshop paper submissions (in advance of the workshop). The possible themes include (but are not limited to) (1) further significant research challenges and opportunities, (2) possible collaborative research themes, and (3) expected applications utilizing our research outputs, with societal deployments. In the discussion phase, we will first split into small subgroups, which will be asked to come up with answers and solutions to a specific theme. At the end of the workshop, each group is asked to present their findings, which will then be again discussed

and summarized. The workshop will conclude with a wrap-up session that would summarize the key discussion points, which will be used to discuss future collaborations and actions.

REFERENCES

- [1] Matthias Böhmer, Christian Lander, Sven Gehring, Duncan P. Brumby, and Antonio Krüger. 2014. Interrupted by a Phone Call: Exploring Designs for Lowering the Impact of Call Notifications for Smartphone Users. In *CHI '14*. ACM.
- [2] Jelmer P. Borst, Niels A. Taatgen, and Hedderik van Rijn. 2015. What Makes Interruptions Disruptive?: A Process-Model Account of the Effects of the Problem State Bottleneck on Task Interruption and Resumption. In *CHI '15*. ACM.
- [3] Karen Church and Rodrigo de Oliveira. 2013. What's Up with Whatsapp?: Comparing Mobile Instant Messaging Behaviors with Traditional SMS. In *MobileHCI '13*. ACM.
- [4] Mary Czerwinski, Eric Horvitz, and Susan Wilhite. 2004. A Diary Study of Task Switching and Interruptions. In *CHI '04*. ACM.
- [5] Nitesh Goyal and Susan R. Fussell. 2016. Effects of Sensemaking Translucence on Distributed Collaborative Analysis. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW '16)*. ACM, New York, NY, USA, 288–302. <https://doi.org/10.1145/2818048.2820071>
- [6] Nitesh Goyal and Susan R. Fussell. 2017. Intelligent Interruption Management Using Electro Dermal Activity Based Physiological Sensor for Collaborative Sensemaking. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 1, 3, Article 52 (Sept. 2017), 21 pages. <https://doi.org/10.1145/3130917>
- [7] Shamsi T. Iqbal and Eric Horvitz. 2010. Notifications and Awareness: A Field Study of Alert Usage and Preferences. In *CSCW '10*. ACM.
- [8] Yasumasa Kobayashi, Takahiro Tanaka, Kazuaki Aoki, and Kinya Fujita. 2015. Automatic Delivery Timing Control of Incoming Email Based on User Interruptibility. In *CHI EA '15*. ACM.
- [9] Gloria Mark, Stephen Vaida, and Armand Cardello. 2012. "A Pace Not Dictated by Electrons": An Empirical Study of Work Without Email. In *CHI '12*. ACM.
- [10] Tadashi Okoshi, Julian Ramos, Hiroki Nozaki, Jin Nakazawa, Anind K. Dey, and Hideyuki Tokuda. 2015. Reducing Users' Perceived Mental Effort Due to Interruptive Notifications in Multi-device Mobile Environments. In *UbiComp '15*. ACM.
- [11] Tadashi Okoshi, Kota Tsubouchi, Masaya Taji, Takanori Ichikawa, and Hideyuki Tokuda. 2017. Attention and Engagement-Awareness in the Wild : A Large-Scale Study with Adaptive Notifications. In *PerCom '17*. IEEE.
- [12] Veljko Pejovic and Mirco Musolesi. 2014. InterruptMe: Designing Intelligent Prompting Mechanisms for Pervasive Applications. In *UbiComp '14*. ACM.
- [13] Martin Pielot, Karen Church, and Rodrigo de Oliveira. 2014. An In-situ Study of Mobile Phone Notifications. In *MobileHCI '14*. ACM.
- [14] Martin Pielot and Luz Rello. 2015. The Do Not Disturb Challenge: A Day Without Notifications. In *CHI EA '15*. ACM.
- [15] Benjamin Poppinga, Wilko Heuten, and Susanne Boll. 2014. Sensor-Based Identification of Opportune Moments for Triggering Notifications. *IEEE Pervasive Computing* (2014).
- [16] Alireza Sahami Shirazi, Niels Henze, Tilman Dingler, Martin Pielot, Dominik Weber, and Albrecht Schmidt. 2014. Large-scale Assessment of Mobile Notifications. In *CHI '14*. ACM.
- [17] Cary Stothart, Ainsley Mitchum, and Courtney Yehnert. 2015. The attentional cost of receiving a cell phone notification. *Journal of experimental psychology: human perception and performance* (2015).
- [18] Dominik Weber, Alexandra Voit, Philipp Kratzer, and Niels Henze. 2016. In-situ Investigation of Notifications in Multi-device Environments. In *UbiComp '16*. ACM.