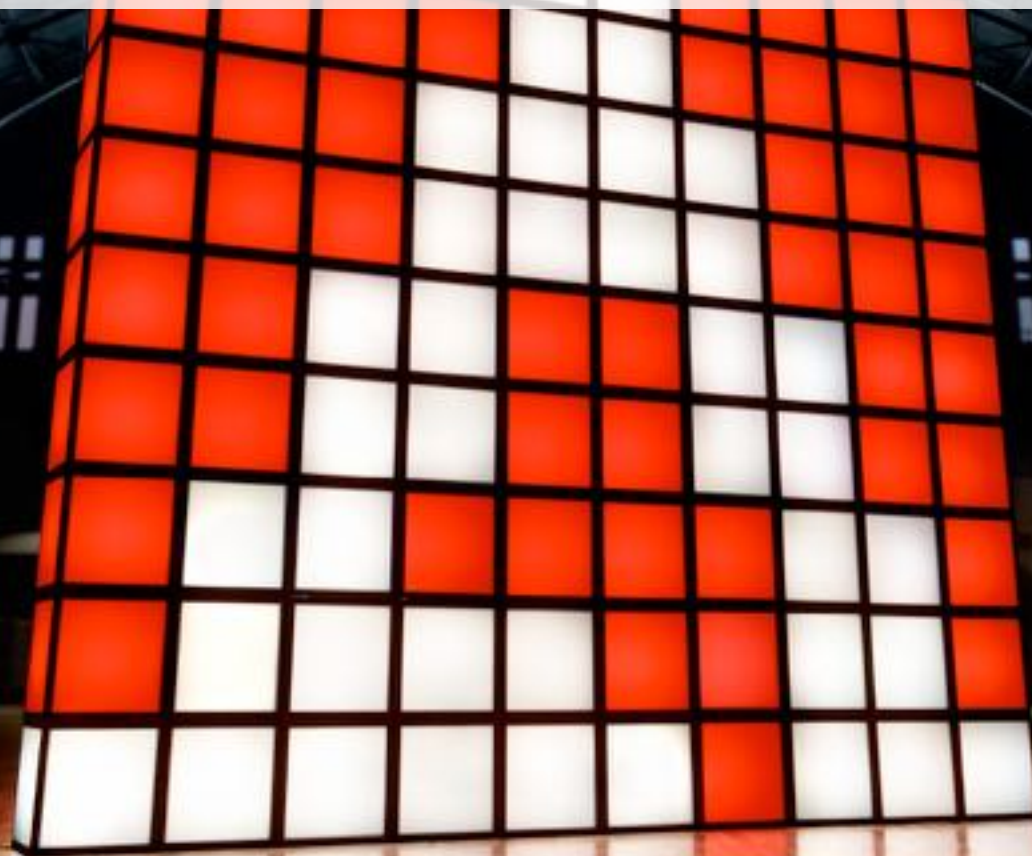




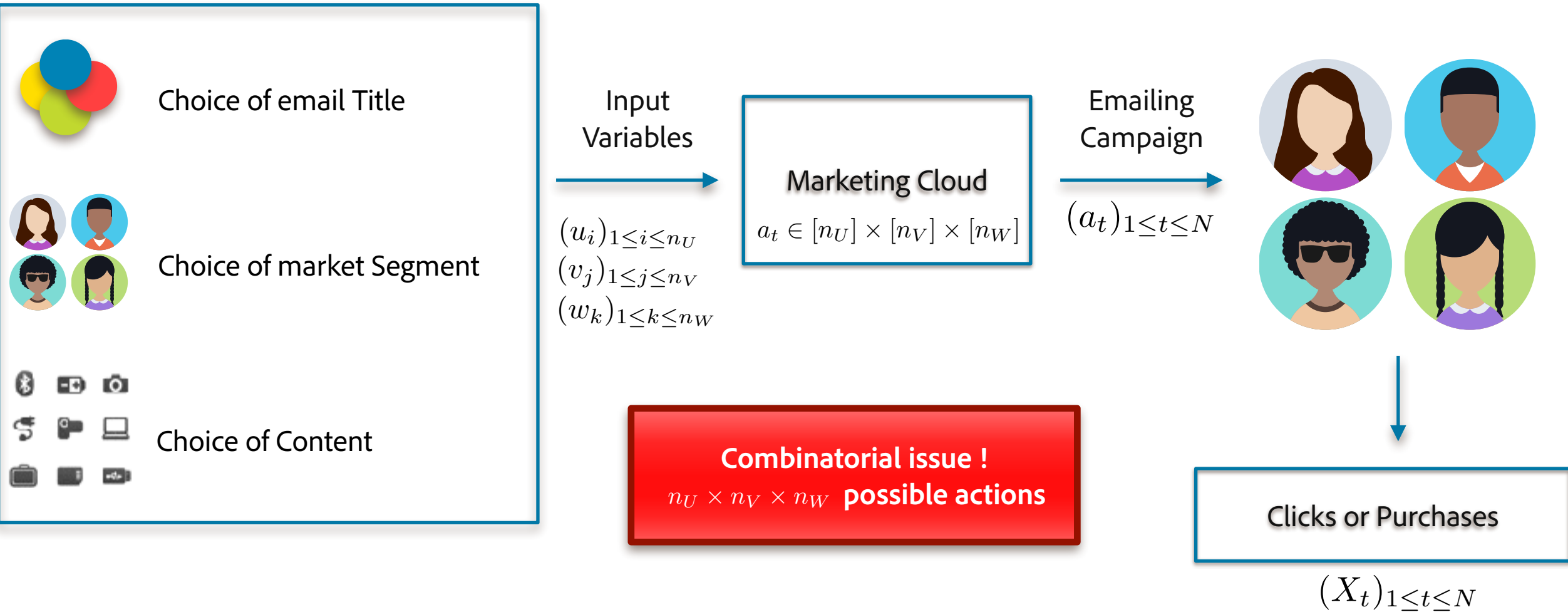
# Sequential Factorial Design for Low-Rank Tensors

Claire Vernade (Branislav Kveton, Mohammad Ghavamzadeh, Zheng Wen, Yasin Abbasi-Yadkori)

Adobe Research (STL/BEL) | 2-March 2017



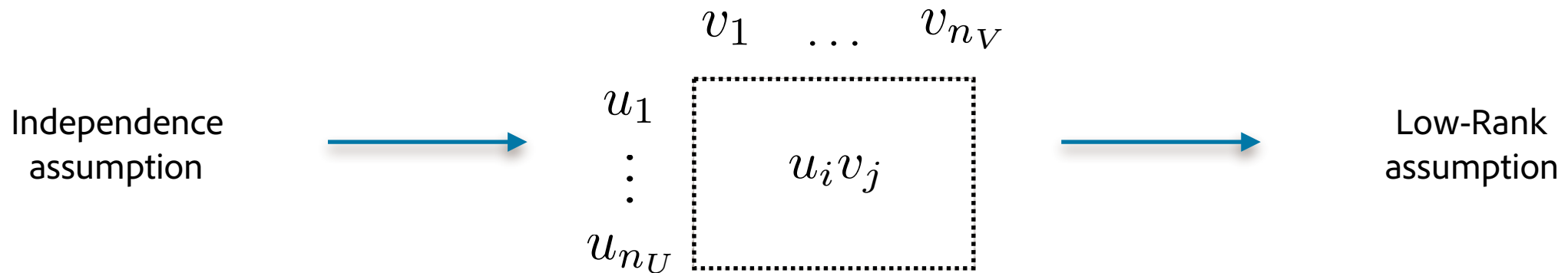
- Current : 3rd year Applied Mathematics Ph.D student at **Telecom ParisTech**
  - Research focus area(s): **Multi-Armed Bandits**, Online Learning, Machine Learning
  - My contact outside Adobe – [claire.vernade@telecom-paristech.fr](mailto:claire.vernade@telecom-paristech.fr)
- Some interesting projects I've worked on...
  - *Stochastic Rank-1 Bandits* (Adobe team, S.Katariya, B.Kveton, Z.Wen, C.Szepesvari): AISTATS 2017 and IJCAI 2017 (submitted)
  - *Multiple-Plays Bandits in the Position-Based Model* (Telecom, O.Cappé & P.Lagrée): NIPS 2016
  - *Stochastic Sparse Bandits* (ENS Cachan, V.Perchet, J.Kwon): COLT 2017 (submitted)



*Current design solutions for building sequences of actions:*

- Fix an A/B test time budget  $\mathcal{T}$
- Choose arbitrarily or randomly a Title and a Content
- A/B test on the Segments for  $\mathcal{T}$  time steps
- Pick the best Segment identified in the previous step and run the obtained campaign until the end.

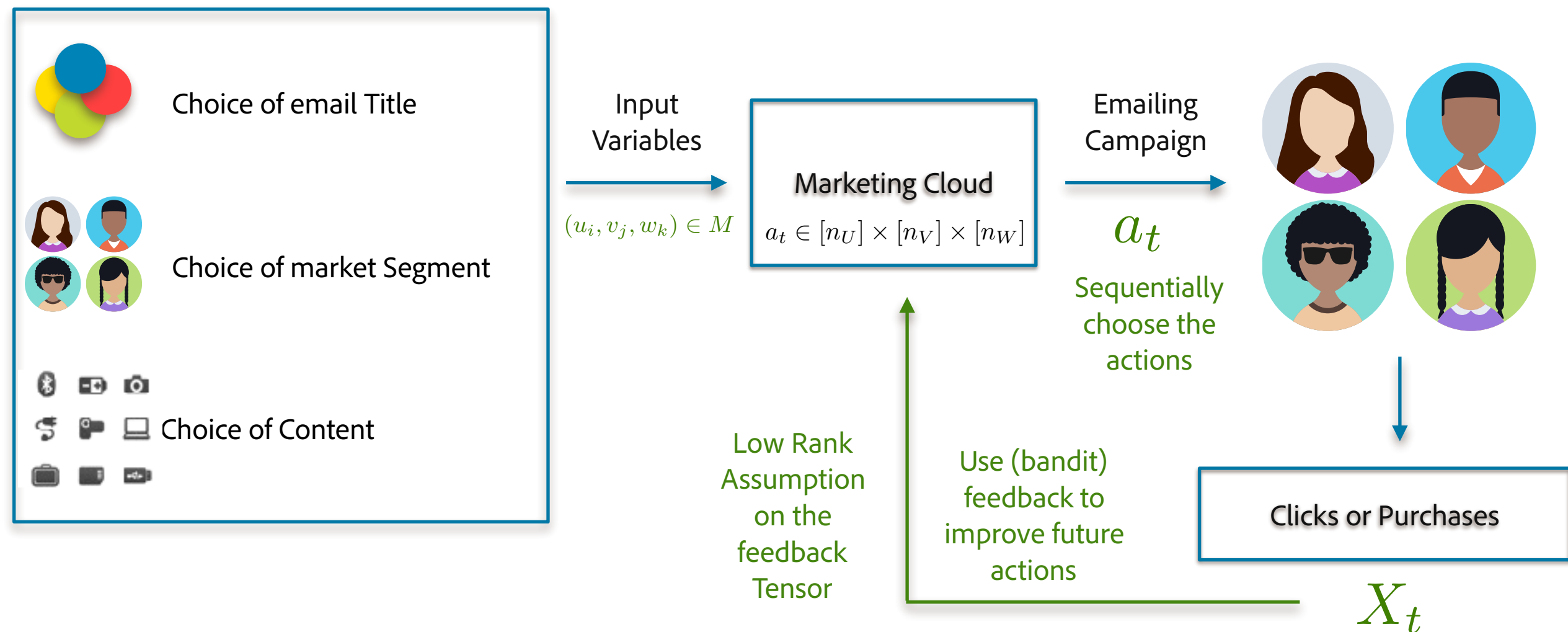
**No A/B test on the Title and the Content.**



*We propose to leverage the structure of the rewards to perform A/B test on all dimensions*

- *Current design solutions **do not allow to try all combinations of features**;*
- *We propose to overcome this difficulty by making **low rank assumptions on the structure of the rewards**;*
- *This will allow to alleviate the **high dimension** of the initial problem.*
- *Based on recent advances on Rank-1 Bandits in the Regret Minimization setting, we suggest to address the above problem as a **Best Arm Identification problem**.*

# Motivation for a Best Arm Identification Framework for Factorial Design





## ■ Relevant academic publications

- Katariya, S., Kveton, B., Szepesvari, C., Vernade, C., & Wen, Z. (2016). Stochastic Rank-1 Bandits. AISTATS 2017.
- Katariya, S., Kveton, B., Szepesvari, C., Vernade, C., & Wen, Z. (2016). Bernoulli Rank-1 Bandits for Click Data. Submitted to IJCAI 2017.
- Jamieson, K., & Nowak, R. (2014, March). Best-arm identification algorithms for multi-armed bandits in the fixed confidence setting. In Information Sciences and Systems (CISS), 2014 48th Annual Conference on (pp. 1-6). IEEE.
- Garivier, A., & Kaufmann, E. (2016, February). Optimal best arm identification with fixed confidence. In Proceedings of the 29th Conference On Learning Theory.
- Gabillon, V., Ghavamzadeh, M., & Lazaric, A. (2012). Best arm identification: A unified approach to fixed budget and fixed confidence. In Advances in Neural Information Processing Systems (pp. 3212-3220).

- Week 1-3
  - Define project and relevant statistical frameworks to be considered
  - Set up first meetings with the team members
  - Present Inception Talk
- Week 4-6
  - Recent literature review
  - First results: Lower Bounds, Algorithms and sketches of Analysis
  - Seek real data for further validation of the framework
  - Set up code infrastructure for future experiments
- Week 7-9
  - Run experiments on simulated and possibly real Click data
  - Refine and wrap up the analysis of the algorithms
- Week 10-13
  - Prepare a paper for a NIPS submission





**Adobe**