

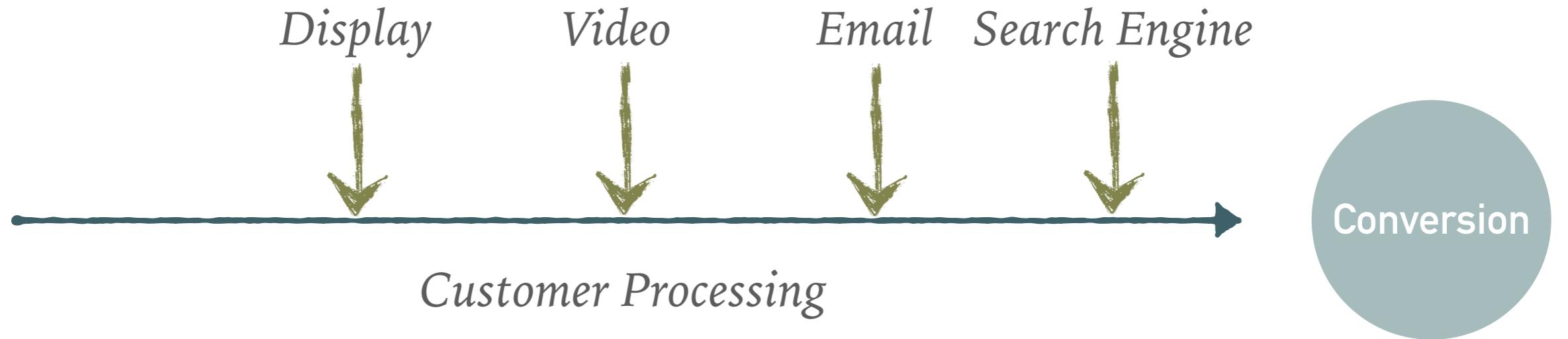


# *Evaluation and Optimisation for Multi-touch Attribution Model*

---

*Shanghai Jiao Tong University  
APEX Data & Knowledge Management Lab  
Jiajun Li*

# Conversion Attribution Analysis



Model	Attributions			
Last-touch	0%	0%	0%	100%
Linear	25%	25%	25%	25%
Time Decay	10%	20%	30%	40%
Position Based	40%	10%	10%	40%



## STRENGTHS AND WEAKNESSES

---

- + Easy to understand
  
- - Ignore interaction effects
  
- - Ignore channel biased

Data-driven Needed!!

# DATA-DRIVEN ATTRIBUTION MODEL

---

- Statistics
  - Logistic Regression [SL'11]
  - Probabilistic Method [SL'11] [GSD'14]
- Economics & Game Theory
  - Shapley Value [DS'12]
  - Survival Theory [ZWR'14]
- .....

# DATA-DRIVEN ATTRIBUTION MODEL

---

- Statistics
  - Logistic Regression [SL'11]
  - Probabilistic Method [SL'11] [GSD'14]
- Economics & Game Theory
  - Shapley Value [DS'12]
  - Survival Theory [ZWR'14]
- .....

# PROBABILISTIC MODEL [SL'11]

---

- Calculate the conversion ratios for users that have been exposed exclusively to one channel:

$$P(y|x_i) = \frac{N_{positive}(x_i)}{N_{positive}(x_i) + N_{negative}(x_i)}$$

- And the contribution of a channel can be calculated:

$$C(x_i) = P(y|x_i) + \frac{1}{2N_{j \neq i}} \sum_{j \neq i} \{P(y|x_i, x_j) - P(y|x_i) - P(y|x_j)\}$$

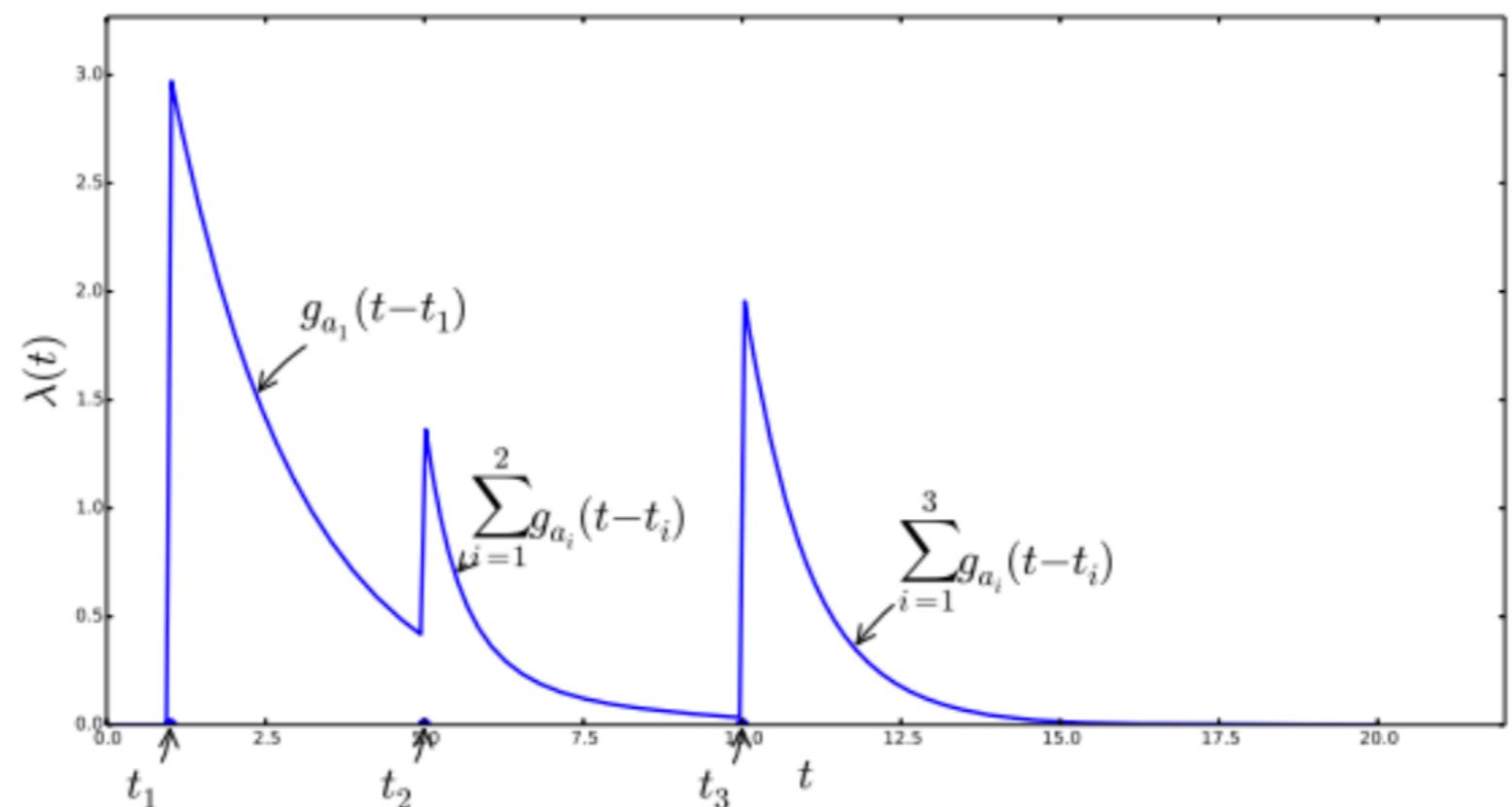
# SURVIVAL THEORY MODEL [ZWR'14]

---

- User's behaviour is defined as hazard function:

$$\lambda_u(t) = \sum_{t_i \leq t} \beta_{a_i} \omega_{a_i} \exp(-\omega_{a_i}(t - t_i))$$

- Which Looks Like:



# SURVIVAL THEORY MODEL [ZWR'14]

---

- With the log-likelihood function to fix variables
- The contribution of a channel can be calculated:

$$p_i^u = \frac{\beta_{a_i^u} \omega_{a_i^u} \exp(-\omega_{a_i^u}(T_u - t_i^u))}{\sum_{i=1}^{l_u} \beta_{a_i^u} \omega_{a_i^u} \exp(-\omega_{a_i^u}(T_u - t_i^u))}$$



# OUR WORK

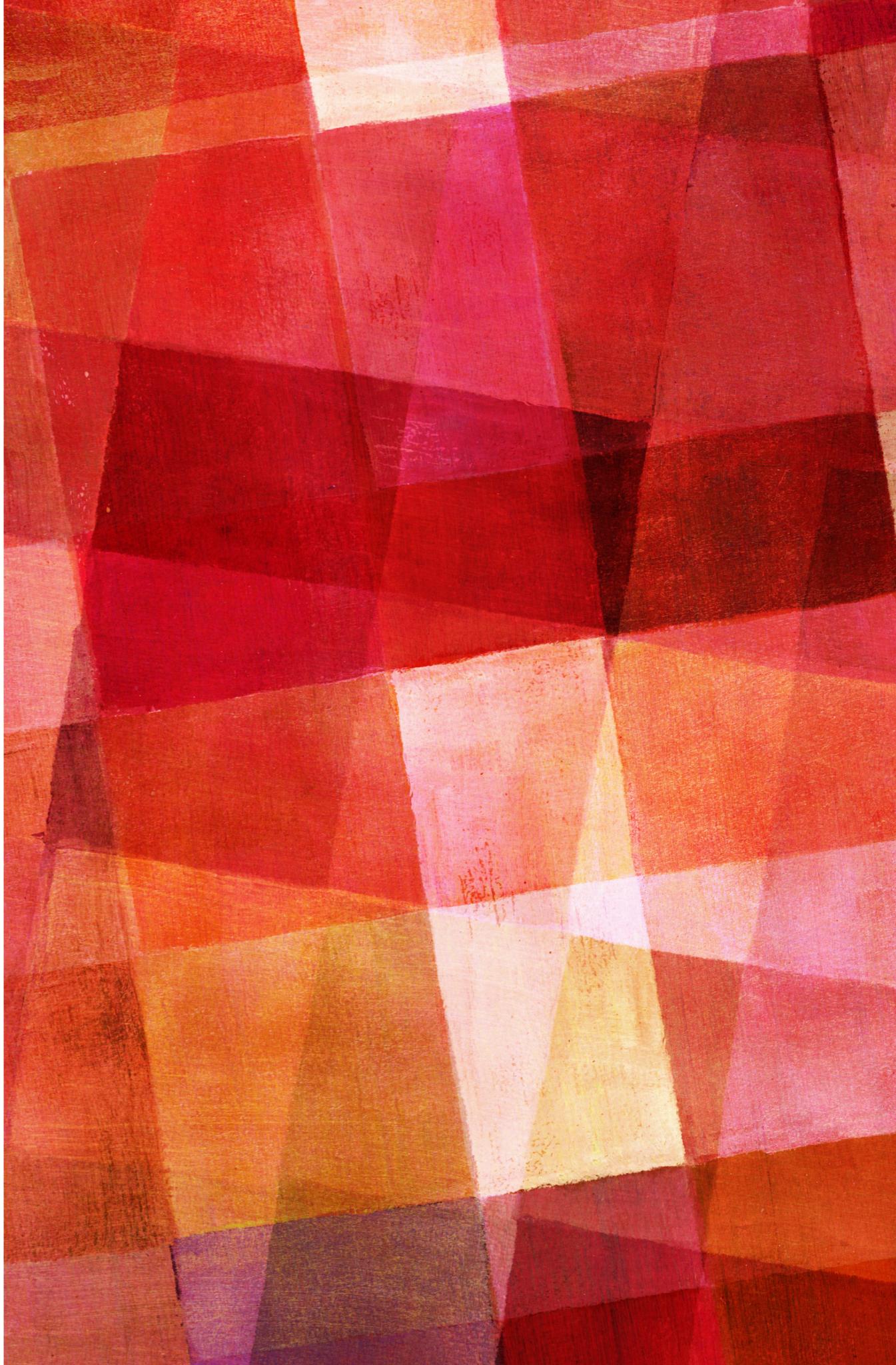
---

- More Powerful Attribution Model
- Combination
- New Strategy
- Offline Evaluation [LCLS'10]
- Budget Allocation [GSD'14]
- Data-set filter: Unbiased
- (Sequence points) -> (CVR)

# OUR NEEDS

.....

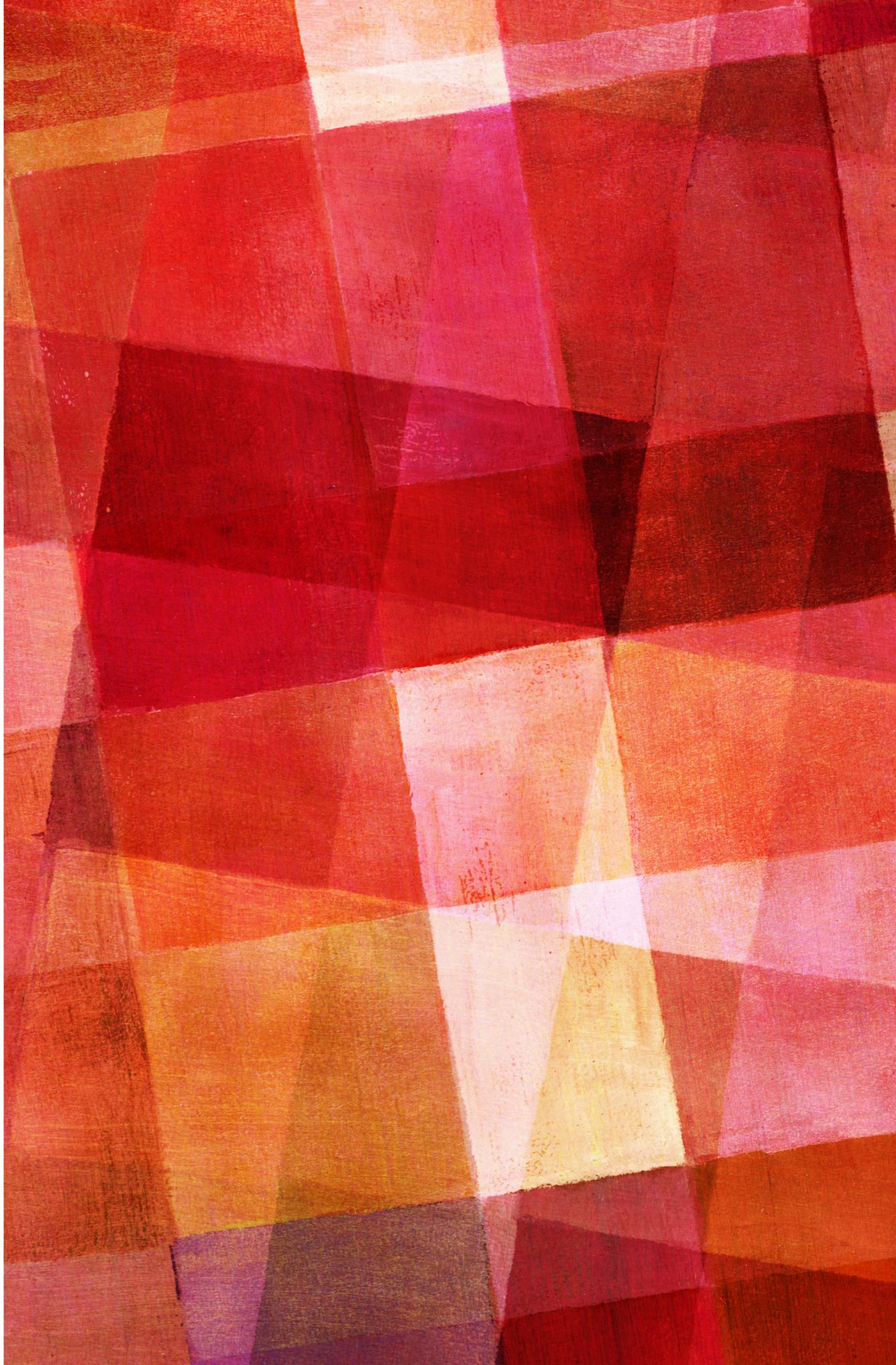
- usr behaviour in multi-channel
  - Conversion Sequence
  - N\_Channel = around 10
    - To robust reduction
  - Time delay (Survival Model)
  - Special Actions
  - ...



# OUR NEEDS

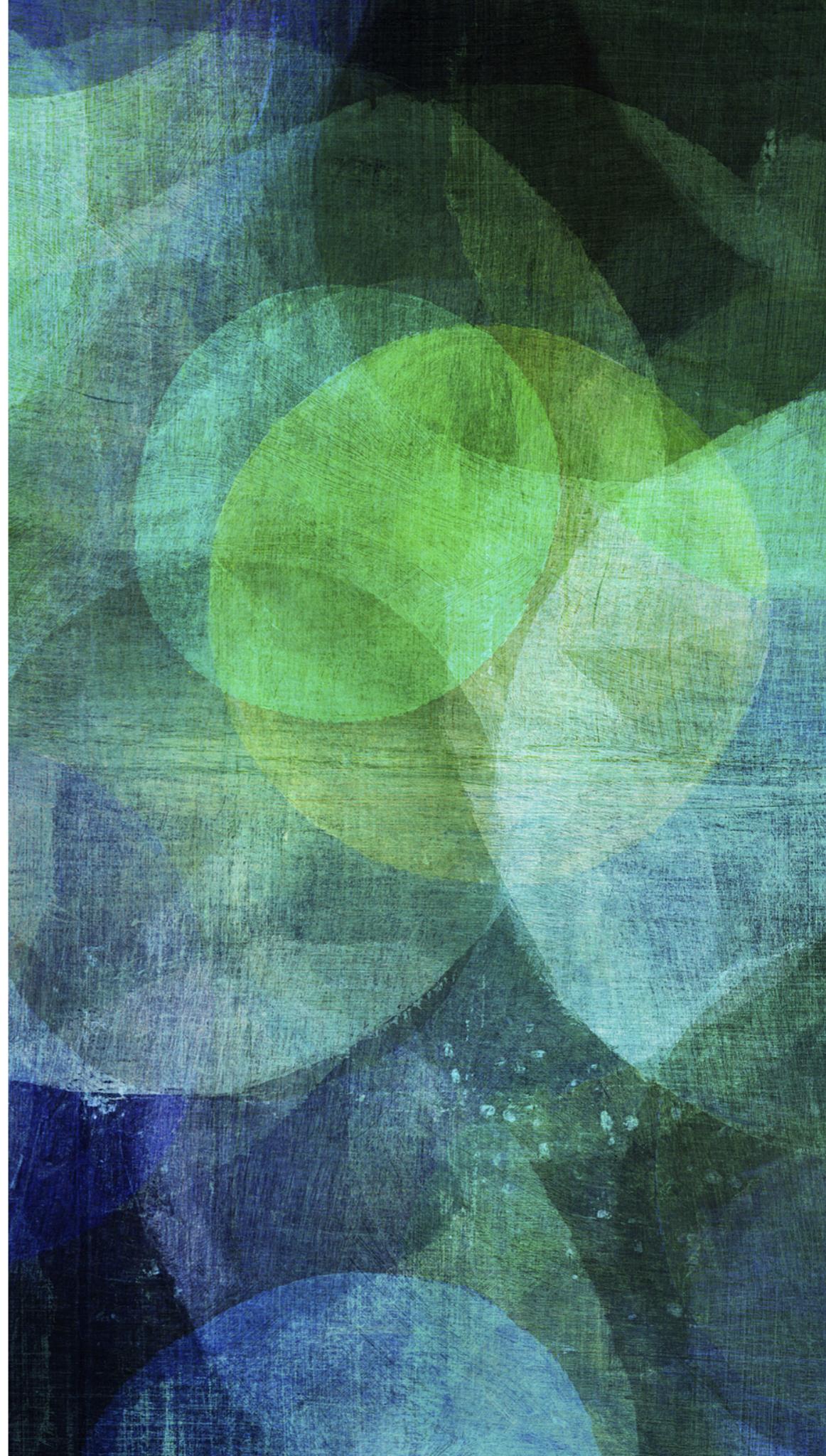
.....

- usr behaviour in multi-channel
  - Conversion Sequence
  - N\_Channel = around 10
    - To robust reduction
  - Time delay (Survival Model)
  - Special Actions
- ...



# REFERENCE

---



# REFERENCE

---

- [ZWR'14] Multi-Touch Attribution in Online Advertising with Survival Theory by Ya Zhang, Yi Wei, and Jianbiao Ren. ICDM 2014.
- [GSD'14] Multi-Touch Attribution Based Budget Allocation in Online Advertising by Sahin Cem Geyik, Abhishek Saxena, Ali Dasdan. ADKDD 2014.
- [DS'12] Causally Motivated Attribution for Online Advertising. by Brian Dalessandro et al. ADKDD 2012.
- [SL'11] Data-driven Multi-touch Attribution Models. by Xuhui Shao, Lexin Li. KDD 2011.
- [LCLS'10] Lihong Li, Wei Chu, John Langford, Robert E. Schapire: A contextual-bandit approach to personalized news article recommendation. WWW 2010: 661–670
- [LCLW'11] Lihong Li, Wei Chu, John Langford, Xuanhui Wang: Unbiased offline evaluation of contextual-bandit-based news article recommendation algorithms. WSDM 2011: 297–306