



SMARTLY.IO

Automating Facebook marketing

Veli Peltola
Data scientist

My background

- 2002–2003** Educational software for statistics and probability theory
at the Systems Analysis Laboratory
- 2005–2011** Analyzing time series using Bayesian variable models,
particularly with variational Bayesian methods
at the Department of Information and Computer Science
- 2012–2014** Number theory with applications to coding theory
2014–2015 Formal proofs
at the Department of Mathematics and Systems Analysis
- 2015–** Facebook Marketing automation
at Smartly.io



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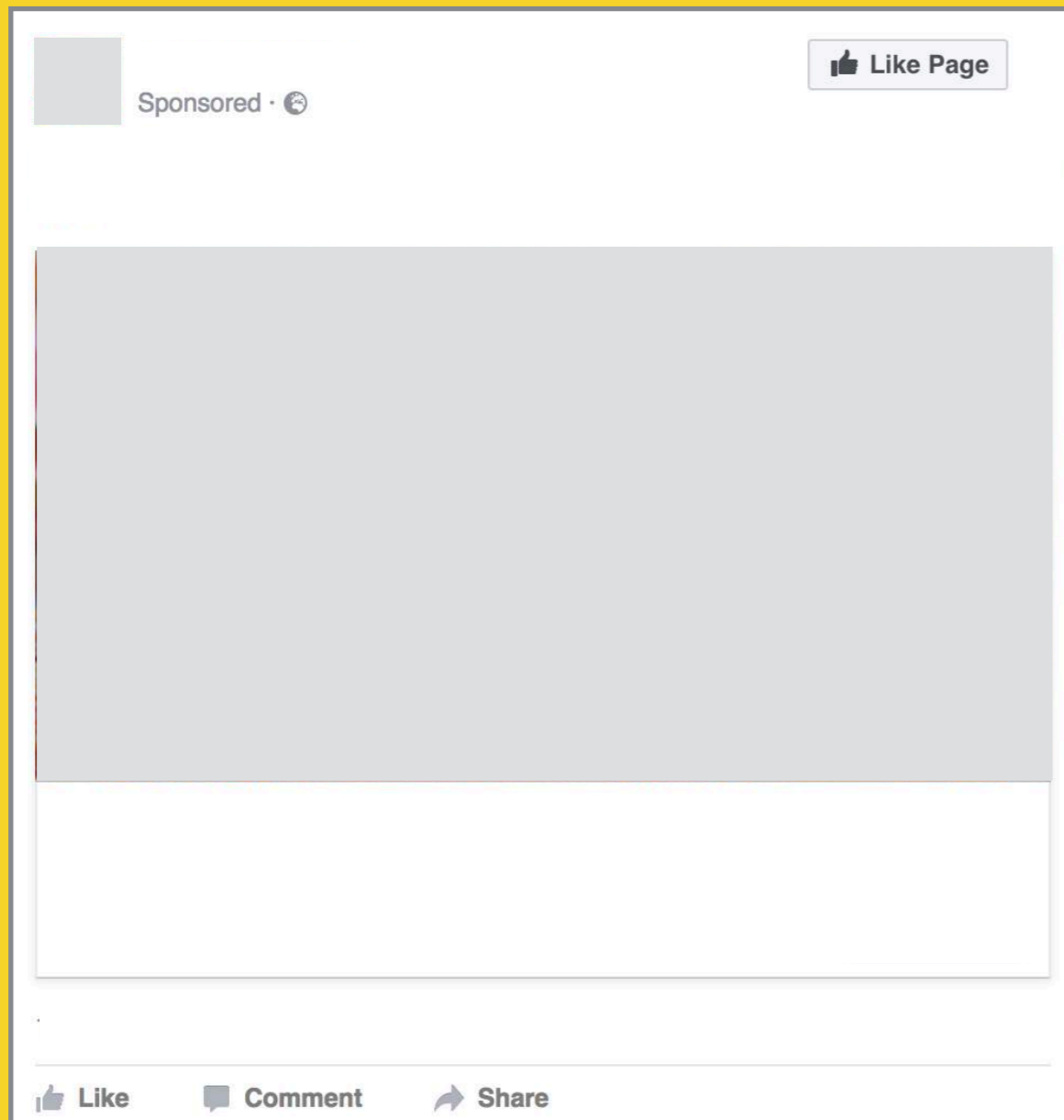
Facebook Marketing Partner

Facebook vs Traditional advertising

More measurable

More targeted

**How to set prices when you
have close to 2 billion users?**



**Apricot
company**

0.004 €



**Banana
company**

0.003 €



**Coconut
company**

0.002 €



**Dragon fruit
company**

0.001 €





Apricot company

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Apricots

Our apricots are delicious! Why don't you get some?

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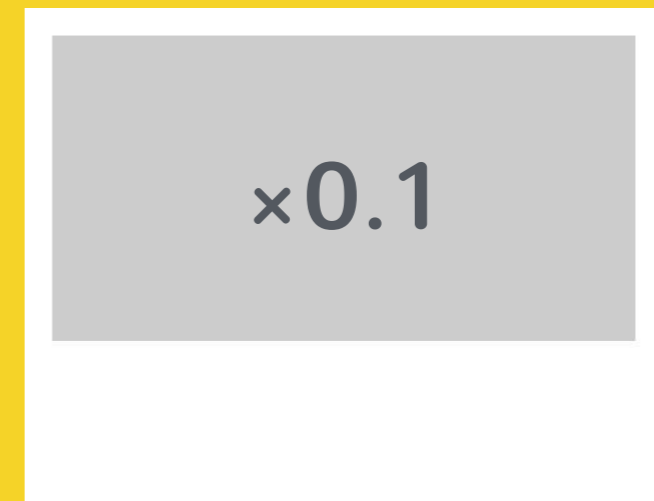
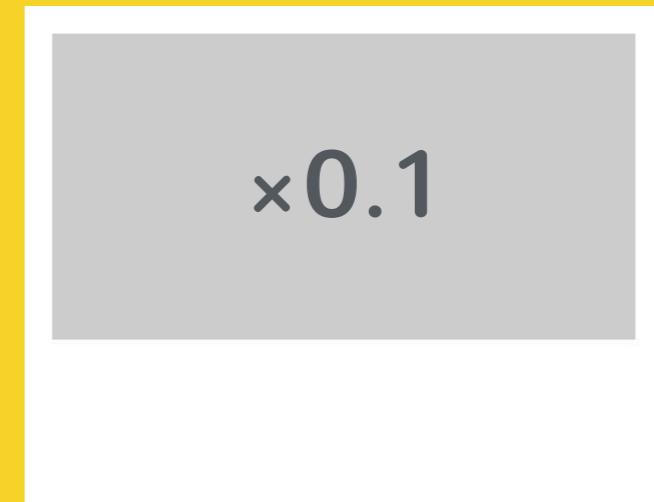
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banana-company.com
Buy some bananas!



Coconuts
coconut-company.com
Buy some coconuts!

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Vickrey-Clarke-Groves auction

	Banana company	Coconut company	Dragon fruit company
Value without Apricot company	0.003 €	0.0002 €	0.0001 €
Value with Apricot company	0.0003 €	0.0002 €	0 €
Harm	0.0027 €	0 €	0.0001 €

Total harm to others = 0.0028 €

Bid = Probability of conversion × Value of conversion

$$\text{Effective bid} = \text{Probability of conversion} \times \text{Bid for conversion} + \text{Relevance term}$$

"True value"

How to handle a finite budget?

ad opportunities
over time



Pacing

ad opportunities
over time



What is there left to do?

Predictive Budget Allocation

**Campaign = a collection of ads
that have the same goal**

**The campaign budget should go
to the best-performing ads**

Balance exploration vs exploitation

Multi-armed bandit

Approximate solution:

**Set budget proportion to the
probability that an ad is the
best-performing one**

**Implemented in Python
(originally R)**

Sampling

Started very simple

**Hierarchical models, time
series, revenue, ...**

What is important to us?

Fast implementation

Robustness

Customer impact

Explainability

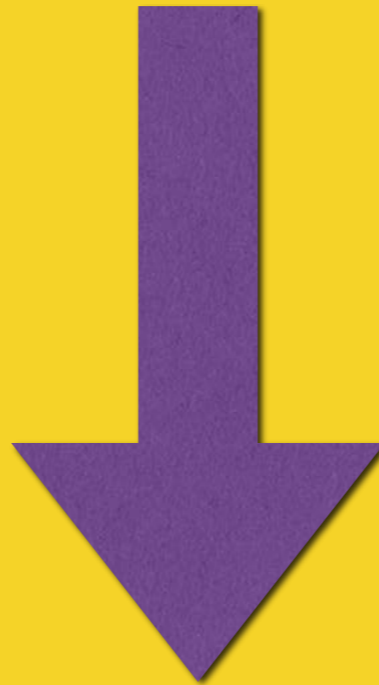
Not so important:

Performance

Ad hoc

Anything that works

Distinct optimization features



Libraries (e.g. Stan)

Clear separation:

Model + Approximations + Optimization

Coherent optimization suite

Thank you!