Optimization of advertisement revenue for the French TV group TF1

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Submission to the EURO Excellence in Practice Award 2012

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The Bouygues Group

96.6% ROADS — COLAS — 1986

100% BUILDING/CIVIL WORKS — BOUYGUES CONSTRUCTION — 1952

100% PROPERTY — Bouygues Immobilier — 1956

Pronounce « bweeg »

CONSTRUCTION

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2006

POWER-TRANSPORT

ALSTOM 30.8%

1994

TELECOMS

Bouygues Telecom

89.5%

1987

MEDIA

TF1

43%

Context and Outline

Major media group in Europe

- €2.6 billion in sales, 40% of the French TV advertising market.
- 17 TV channels, 128 radio stations, and 15 websites
- Each French watches 10 000 commercials/year on TF1
- TF1 sells airing time to advertisers (or web views or clicks)

1. Revenue Optimization at TF1

- Internet sites
- Theme channels
- Sales openings for French leading TV channel

2. Lessons learned

- Our good practices as a corporate OR lab
- Illustrated with applications on other business lines of TF1

Optimizing the Revenue of TF1

Sales openings for French leading TV channel

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E. Guyot : Marketing and Revenue Management Director at TF1

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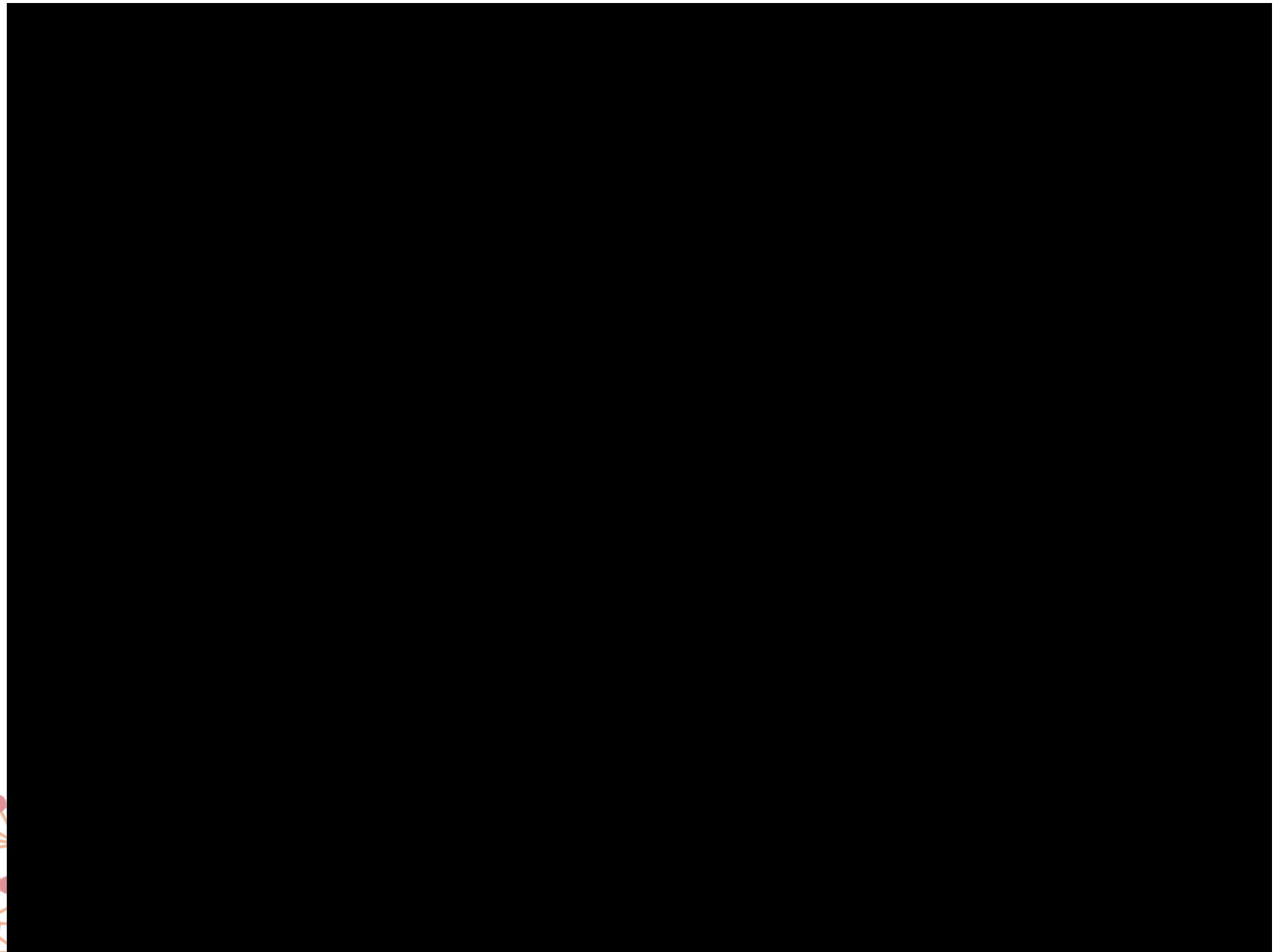
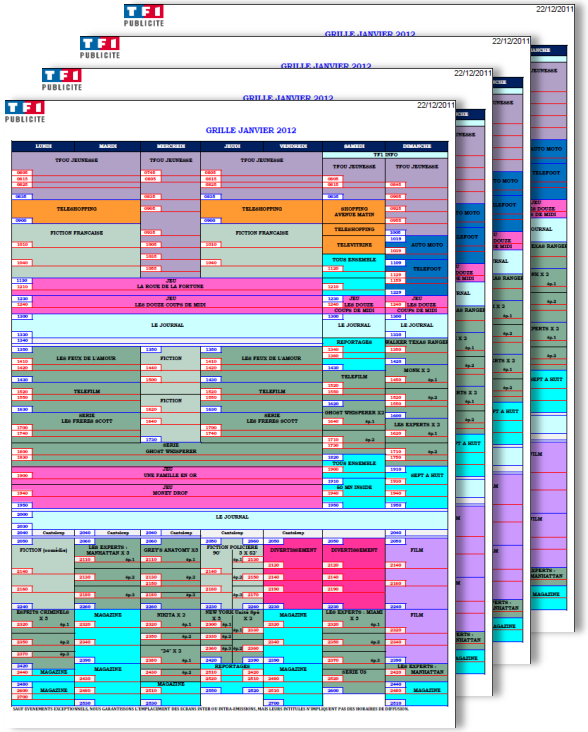


Sales openings

A limited inventory:

- 2 months = 5,000 TV breaks opened for sale



An incoming demand

- Around 30,000 demands

: “I want 28s in TV break 6:30 PM, on May 24th ”

Constraints

- On each TV break: capacity limit + mutual exclusions
- Globally: equity constraints

Decisions

- For each demand: accept or reject (or counter-propose)

Objective: maximize revenue

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Example on a single commercial break

A 60-second commercial break

5 demands:

- Product A: 10s for 10 000 €
- Product B: 20s for 22 000 €
- Product C: 20s for 21 000 €
- Product D: 30s for 30 000 €
- Product E: 40s for 35 000 €

Optimal Solution

ACCEPT
ACCEPT
REJECT
ACCEPT
REJECT

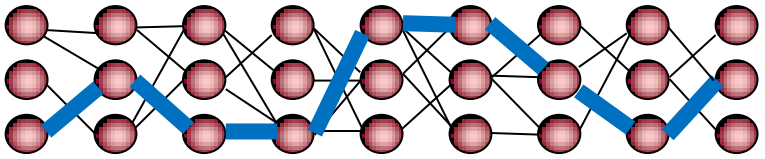
→ Total = 62 000€

→ knapsack problem

→dynamic programming

The dynamic program can be enriched in order to take mutual exclusions into account ("sector constraints")

5000 small knapsacks
(best path = best packing)



Global problem

Coca-Cola : 90% demands accepted

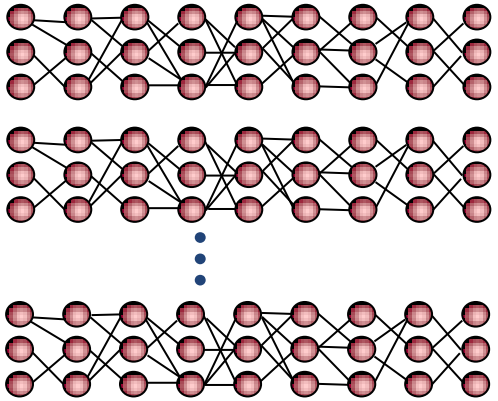
pepsi : 10% demands accepted

?

- **Equity** between advertisers
- **Min satisfaction rate** per advertiser
- Globally and on subsets of demands (prime-time commercials, premium positions, etc.)

Non separable problem:

5000 knapsacks correlated by equity constraints



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Algorithmic Solution 1/3

Greedily accept demands taking satisfaction rate and priorities into account:

1. Let C be the set of advertising companies;
2. **While** C is not empty **do**
   3. Select c in C with minimum acceptance rate;
   4. **If** c has no acceptable request anymore, **then** remove c from C;
   5. **Else,** accept one of the acceptable requests from c.

→ **Which one ?**

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Algorithmic Solution 2/3

Extract reduced values (or "regrets") from dynamic programs

Example:

- Product A: 10s for 10 000 €
- Product B: 20s for 22 000 €
- Product C: 20s for 21 000 €
- Product D: 30s for 30 000 €
- Product E: 40s for 35 000 €

→ **With** product C : 61 000€ at most

Without product C: 62 000€ at most

↓

Reduced value for C is -1000€

We can accept for advertiser A the demand with the **highest reduced value**

= which fits best with the other demands for the same commercial break

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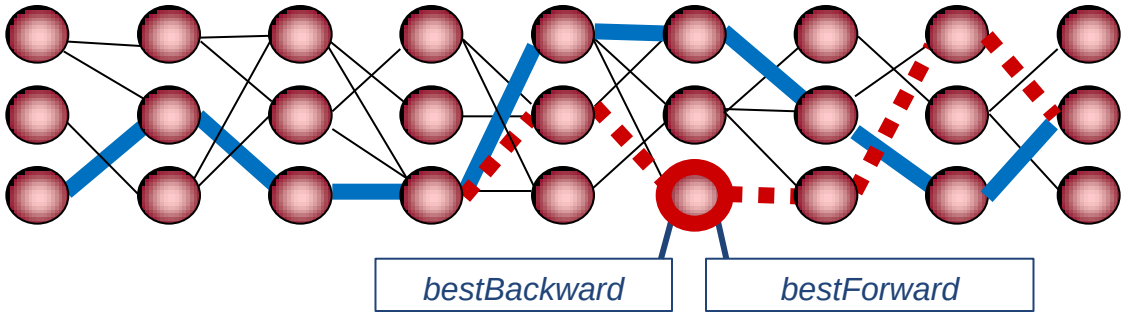
Algorithmic Solution 3/3

How to extract these reduced values ?

Best path via a specific node (state)



→ Complexity doubles (*left to right* + *right to left*)

→ This “oracle” guides the global greedy algorithm:

- ensure equity between advertising companies
- while keeping decisions close to the optimal path (packing) for each commercial break

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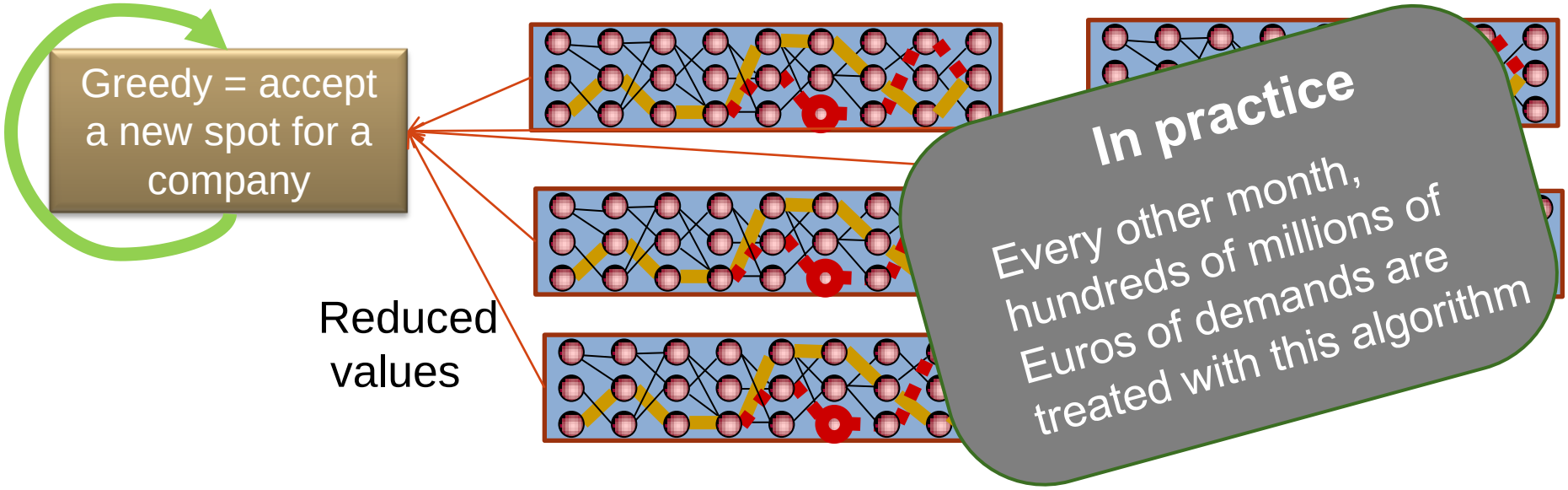
Summary



Optimality gap = 0.13%

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Operational results

Stakes:

- Each sales opening (€1400M/year) optimized with our software

Resulting revenue increase: €20 millions per year

They give TF1 a competitive advantage and optimize our advertisement sales. We estimate the resulting gains at up to €20 million per year.

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Customer Marketing and Revenue Management Director at TF1,

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Lessons learned

Our practices as a corporate OR lab

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Modeling and solving

Not a single preferred technique

- MIP, Dynamic Programming, Constraint Programming, Local Search, …

Finding solutions made easy

- E.g. Minimum satisfaction rates are NOT a constraint but merely a first-rank objective (“goal programming”)

Coca-Cola : 90% demands accepted

pepsi : 10% demands accepted

?

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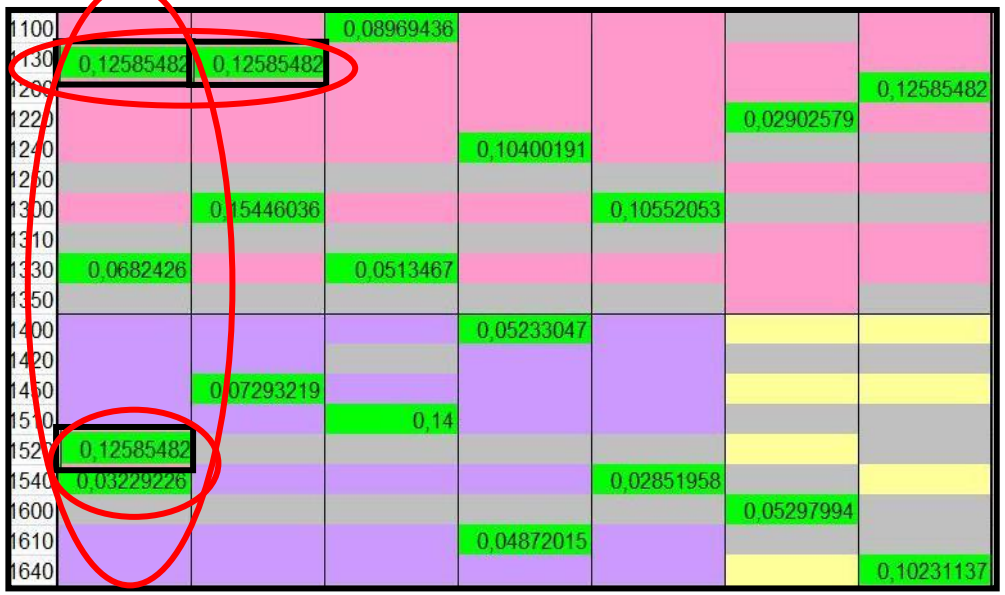
Project Management

We present solutions as early as possible (β-release)

- Demonstrate the feasibility of the project
- Requires a set of input data
- Leads to specifications refining

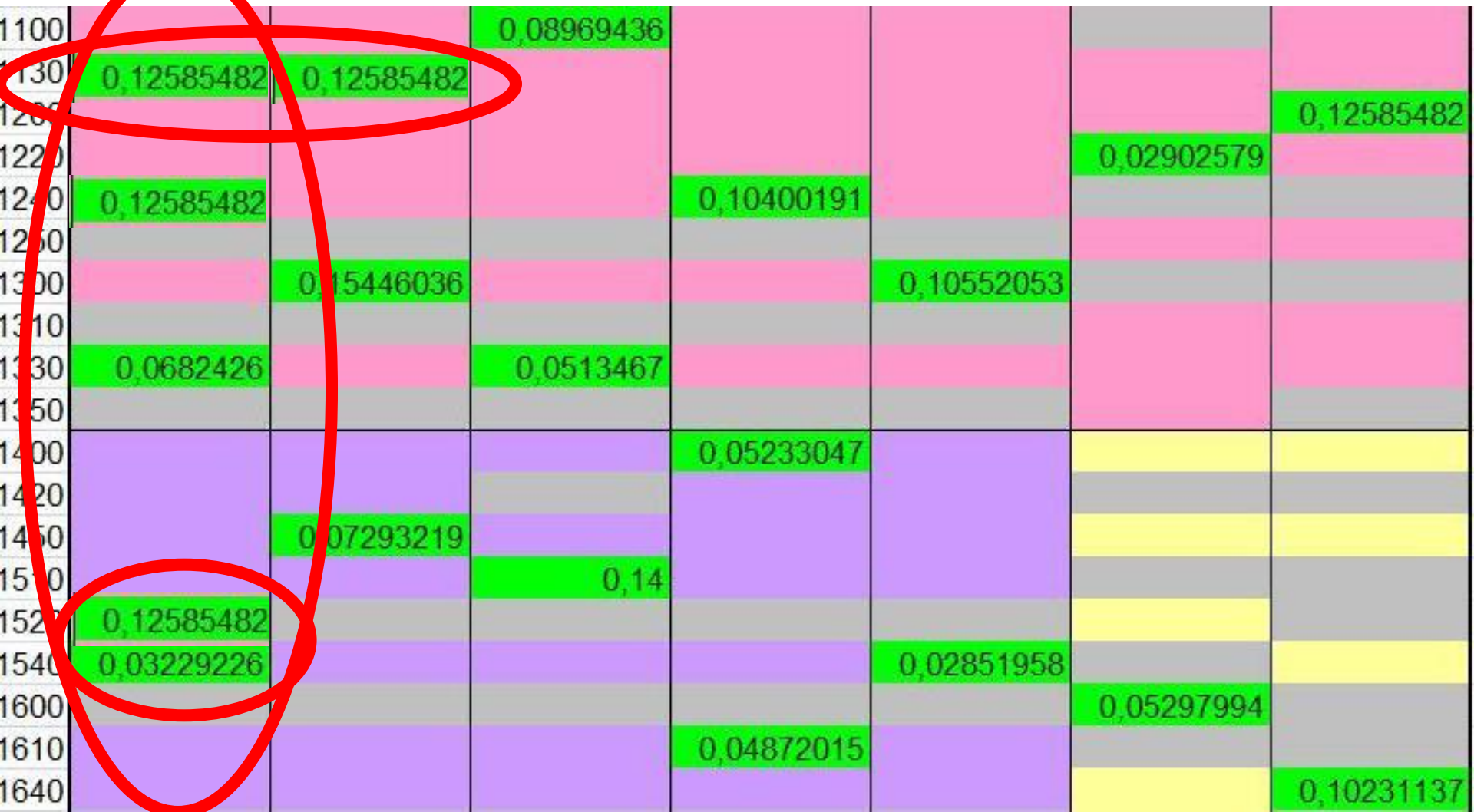


We deliver an "empty shell" as early as possible (α-release)

- → Check integration as early as possible (software integration)

Optimizing Advertisers' Plans

For our 15 theme channels



Research

30% of our time devoted to research

- Beyond operational projects (complexity, lower bounds, exact methods…)
- Sometimes leading to software for OR (Choco, LocalSolver)

Connected to the academic community

- Keeps our technical knowledge current
- Attract high-caliber candidates

Optimizing Internet Click Rates = multiarmed bandit problem

A long term investment

- LocalSolver is now a product and optimizes each week the assignment of "preferred positions" to ads

- Our use of dynamic programs giving sensitivity information actually comes from our academic work on sport scheduling….

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Conclusion

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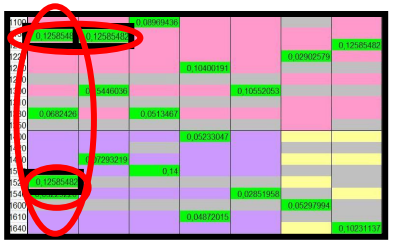
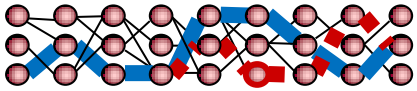
Conclusion 1/2

Various applications of Operations Research



Advanced algorithms to get close to optimality



Significant and measurable gains

« €20 millions per year »

An attempt to share our experience

Lessons Learned from 15 Years of Operations Research for French TV Channel TF1

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Bouygues' corporate operations research team (the Bouygues e-lab) has been working with various sub-

Laurent Solly, Deputy CEO TF1 Publicité

Letter of verification

Thierry Benoist, Frédéric Gardi and Antoine Jeanjean, members of the corporate OR team of Bouygues, have put their mathematical skills to the service of TF1.

They quickly acquired a deep understanding of the TV and advertising business, thus becoming a partner of choice bringing precious quantitative insight helping TF1 to take the right strategic decisions, and able to build powerful operational software optimizing our channel revenues.

Only three examples of this fruitful partnership are described in the article « *Lessons Learned from 15 Years of Operations Research for French TV Channel TF1* », but their practical contribution covers a wider range of topics. For instance when TF1 decided last year a radical change in the marketing offer for one third of our sales, the c-lab was involved in this project from the very beginning (definition of offers) to the operational launch (with an OR engine re-optimizing the advertisement planning every night), since we knew that Operations Research would be a key component in the success of this operation.

Laurent Solly

Vice President TF1 Publicité

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