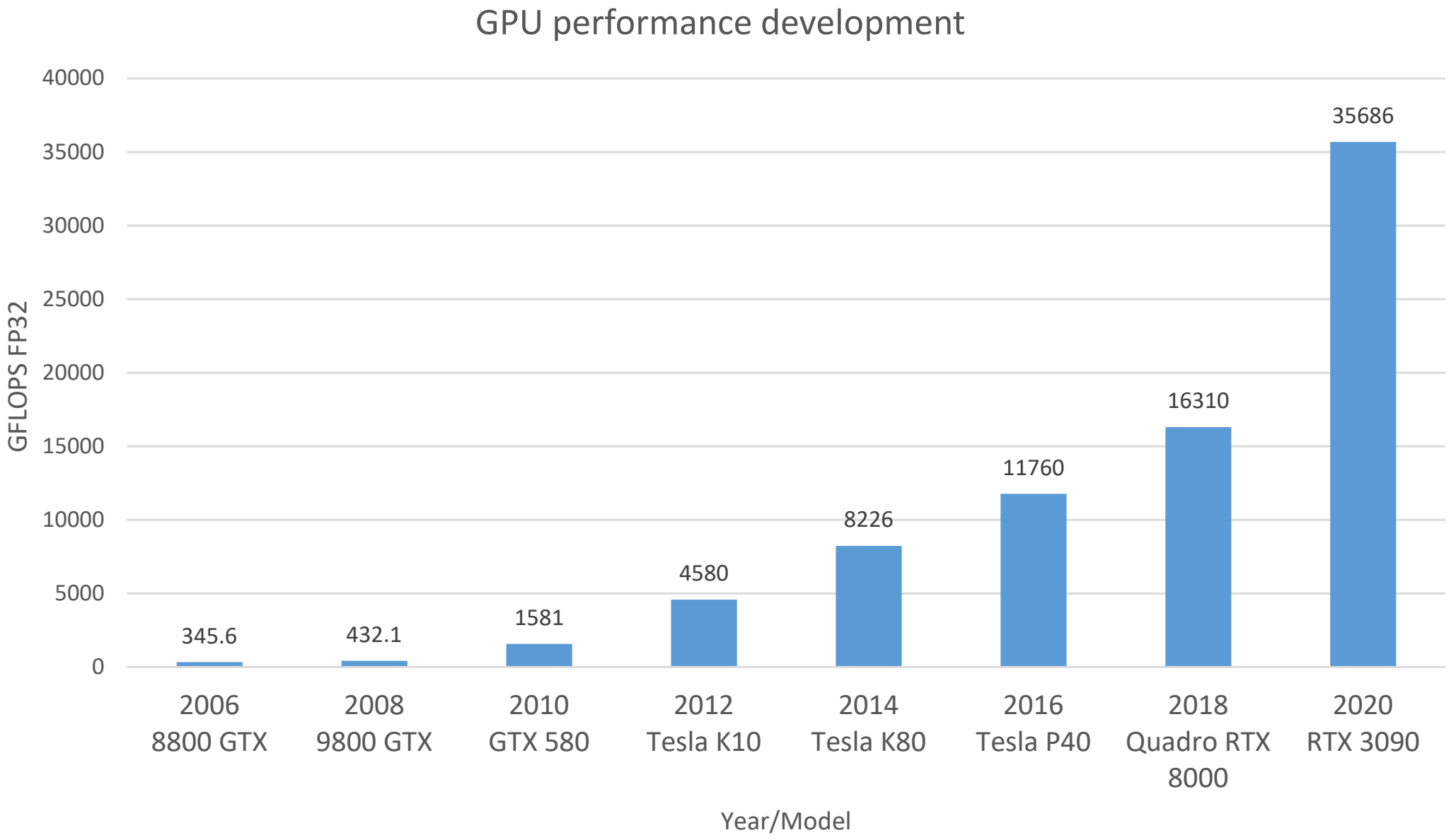
GoHydro

Hans Ivar Skjelbred

User Meeting – 17.11.2021

- Non-linear optimization problem
- GPU speed vs CPU speed
- Scaling properties without algorithmic details


GPU performance development
40000
35000
30000
25000
20000
15000
10000
5000
0
GFLOPS FP32
345.6
432.1
1581
4580
8226
11760
16310
35686
2006
8800 GTX
2008
9800 GTX
2010
GTX 580
2012
Tesla K10
2014
Tesla K80
2016
Tesla P40
2018
Quadro RTX
8000
2020
RTX 3090
Year/Model

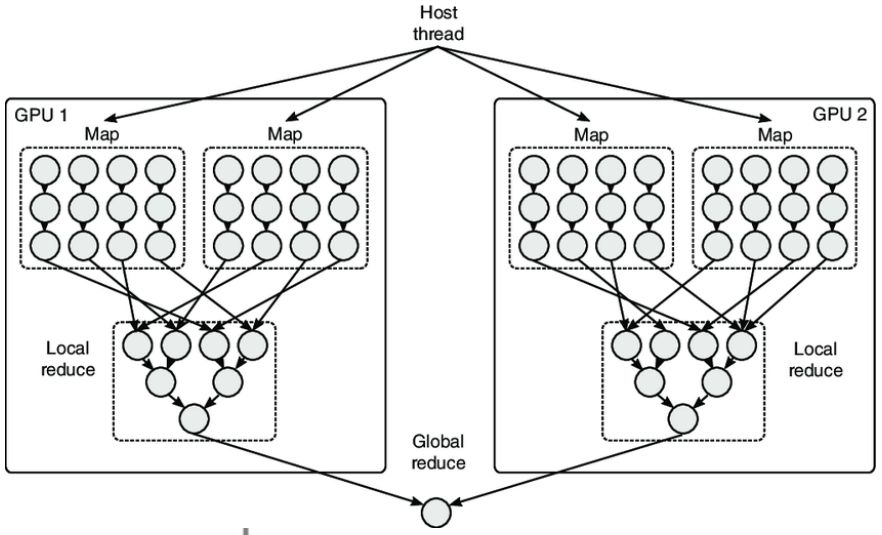
SINTEF

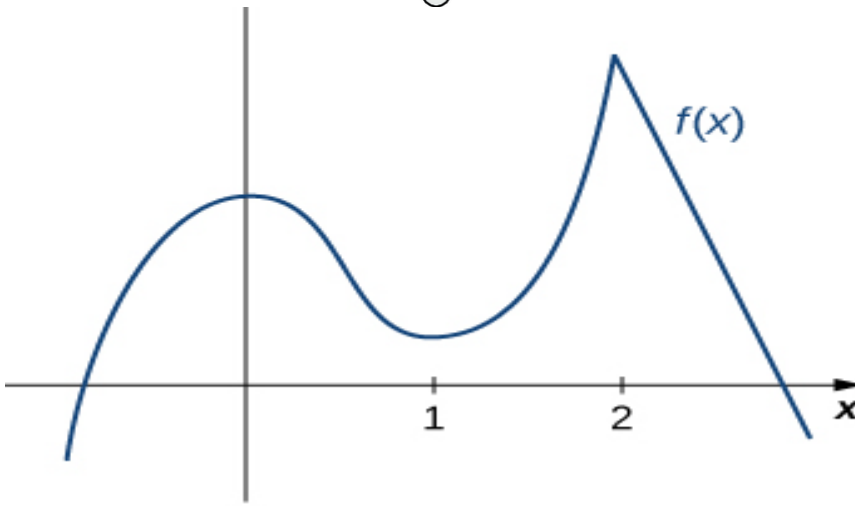
KS Digitalisering 2020

Dele kunnskap og bygge opp infrastruktur for mer utstrakt bruk av GPU-akselerering i SINTEF

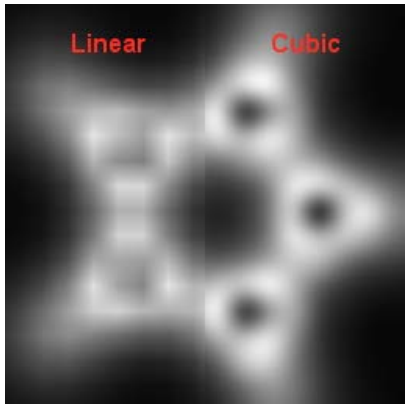
GPU functions

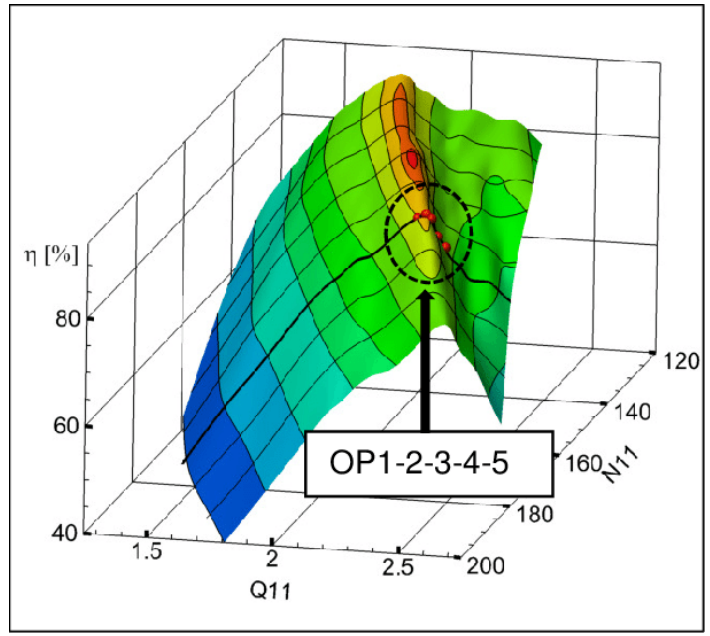
- Maximization



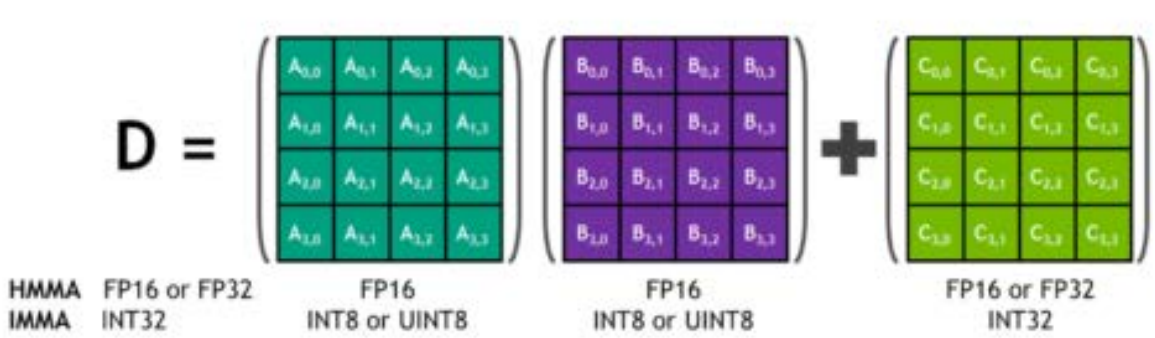


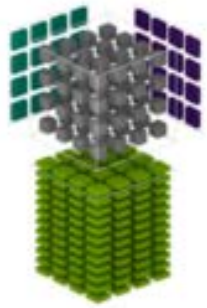
- Interpolation





- Sum product





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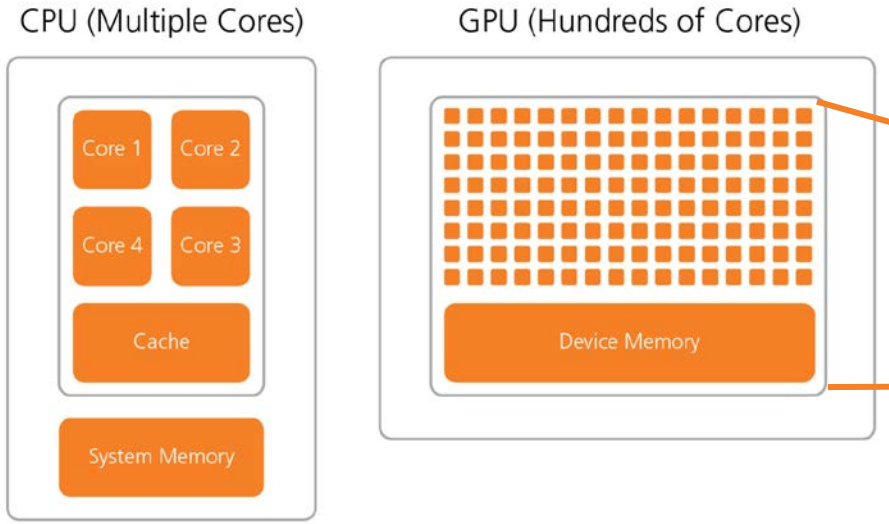
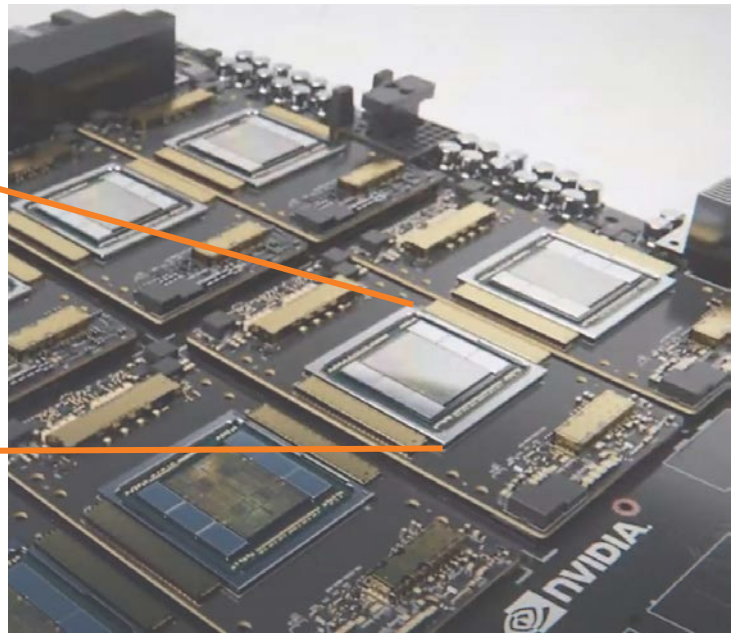
- >100 000 identical tasks that can be solved in parallel
- Efficient memory addressing





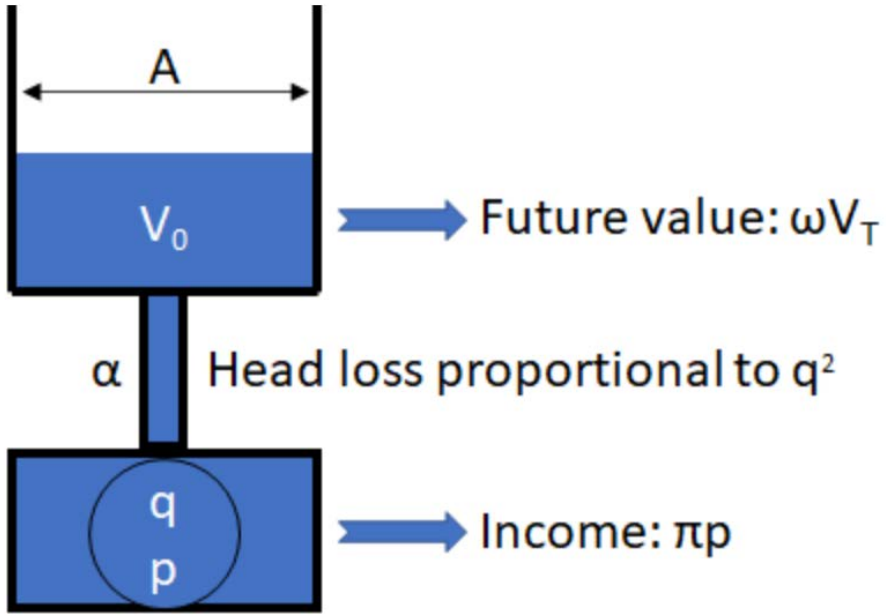
Parallellize search for optimum

Maximize parallellization of the scheduling problem

Scalable algorithm for non-linearities and large-scale problems

- Selection of essential modelling capabilities

Verification vs analytical optimum of non-linear scheduling problem



Objektivfunksjon

$$max \pi_1 p_1 + \pi_2 p_2 + \omega v_{end}$$

Betingelser

$$p_1 = G q_1 \left(\frac{V_0 + V_0 - \gamma q_1}{2A} - \alpha q_1^2\right)$$

$$p_2 = G q_2 \left(\frac{V_0 - \gamma q_1 + V_0 - \gamma q_1 - \gamma q_2}{2A} - \alpha q_2^2\right)$$

$$v_{end} = V_0 - \gamma q_1 - \gamma q_2$$

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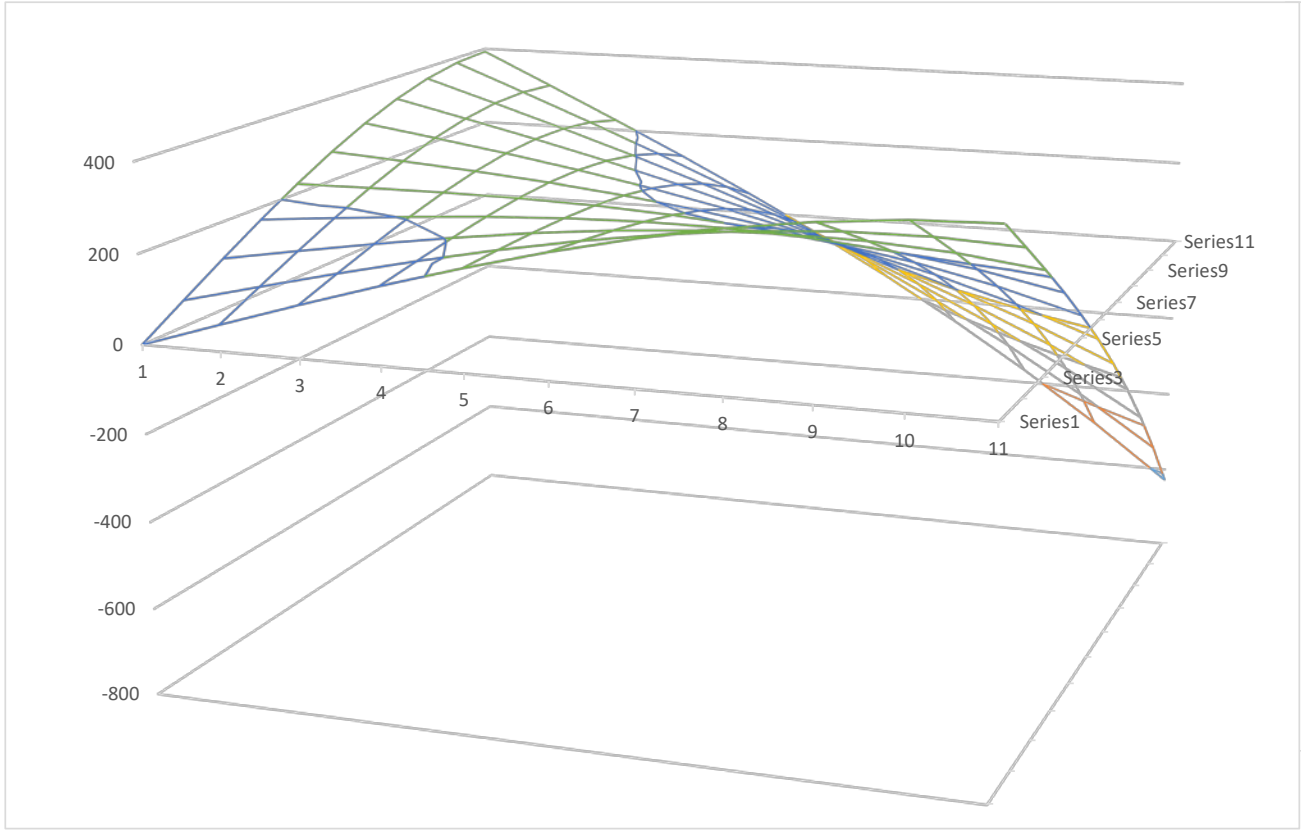
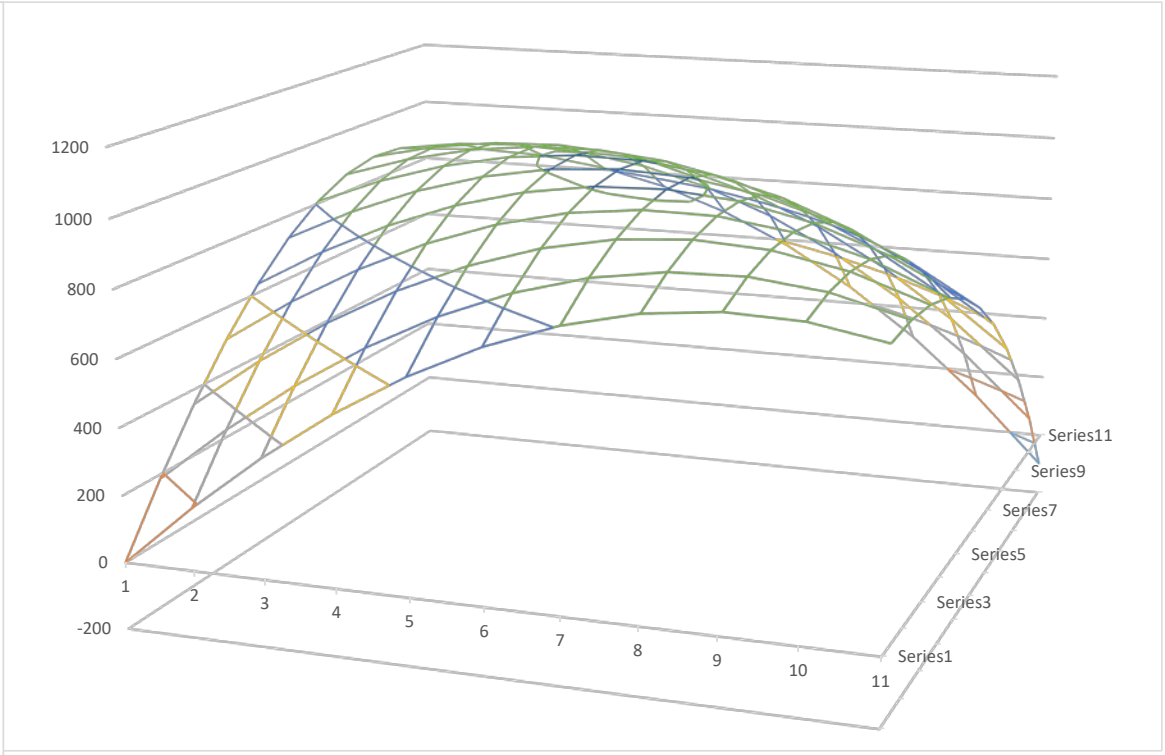
Convexity for non-linear relations

- Compare head optimization with current tools





Current work on algorithmic properties

- Upper bound from decomposed problem
- Lower bound from primal heuristic solution generation
- CPU for investigating iteration logic
- GPU for testing parallellization on various problem sizes
  - memory bandwith
  - CUDA core computation occupancy

	scen1_prod	scen2_prod	scen3_prod	scen1_prod2	scen2_prod2	scen3_prod2
i1	0	28.21983	75.000679			
i2	0	33.617931	0			
i3	0	0	0	41.437439	55.149017	68.449059
SHOP/SHARM	0	0	0	41.44	55.25	68.45

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Teknologi for et bedre samfunn