OCS Hints for Questions

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Derivations

Die Antworten sind teilweise unvollständig, einerseits, weil er die Antworten als "Eh Klar" abgestempelt hat, anderer seits weil er so schnell durchging, dass ein Mitschreiben nicht mehr möglich war.

1. Draw level lines and arrows
   - objective function is the function we want to minimize
   - constraint set is a set of functions
   - optimal solution: find $f(x^*) \leq f(x), \forall x \in X$
   - level set: compareable to level lines of terrain, convex function => convex level set (but there are non convex fct with convex level sets),
2. - **Linear**: Objective Function and Constraints may only be linear
     $min\ c^T x, s.t.\ Ax \leq b, x \geq 0$
     Polynomial solvable
   - **Non Linear**: Objective Function and Constriants may be non linear
     $min\ \frac{1}{2} x^T Q x + c^T x, s.t.\ Ax \leq b, Ex = d$
     Q symmetrical and pos. definite, polynomial solvable
   - **Quadratic**: objective function is quadratic, constraints are linear
     $min_{x \in \mathbb{R}}\ f_0(x)$ `(objective)`,
     $s.t.\ f_i(x) \leq i = 0..m$ `(contraints)`
     polynomial time
   - **convex set**: $\alpha x + (1-\alpha) y\ in X, \forall x, y \in X, \alpha \in [0,1]$
   - **convex fct**: $f(\alpha x + (1-\alpha) y) \leq \alpha f(x) + (1-\alpha) f(y), \forall x, y \in X, \alpha \in [0,1]$
3. - When hessian is strictly positive, it is a strict global maximum
   - **unconst Local minimum:** $f(x^*) \leq f(x), \forall x$ `with` $||x - x^*|| \leq \varepsilon$
   - **unconst global minimum:** $f(x^*) \leq f(x), \forall x \in \mathbb{R}$

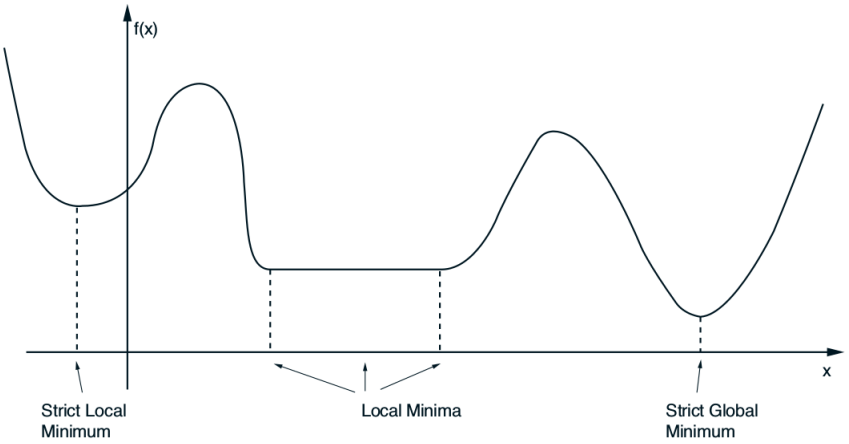

Figure 1: Local/Global minimas

4. If positive and negative Eigenvalues, we can not define convexity
5. Descent direction: angle of step and derivation direction $< 90°$
6. Identity, Hessian, Gauss Newton, Diag Hessian, zik zak
7. upper bound, ~~... too fast...~~
8. Energy convergence
9. ~~too fast~~
10. ~~polynomial euqations, distance to std. Newton~~
11. incremental of gauss newton
12. ~~too fast~~
13. ~~iterative~~
14. nesterov in gradient, heavy-ball just in point
15. in subspace reduce to eq, what is a subspace?
16. First pages of slide 10
17. middle/end of pages slide 10 - start in interior and just take small steps $- >$ we can ignore constraint under these conditions
18. ~~too fast~~
19. see figure 2

20. see figure 3

21. see figure 3

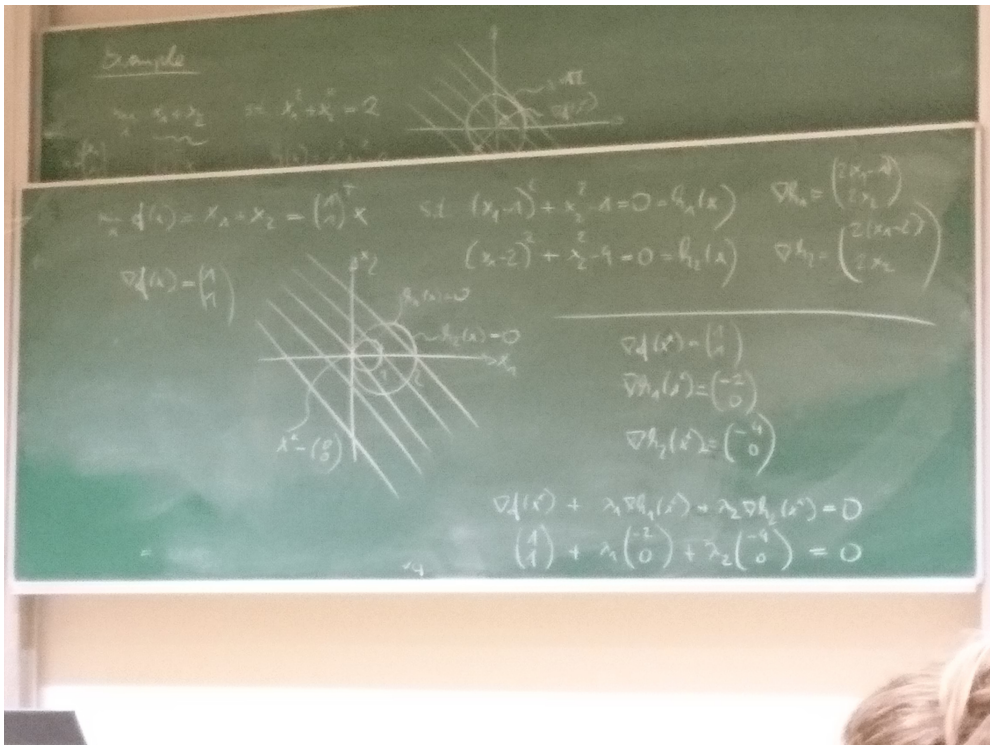

Figure 2: Example1, 24.01.2017

Figure 3: Example 2, 24.01.2017