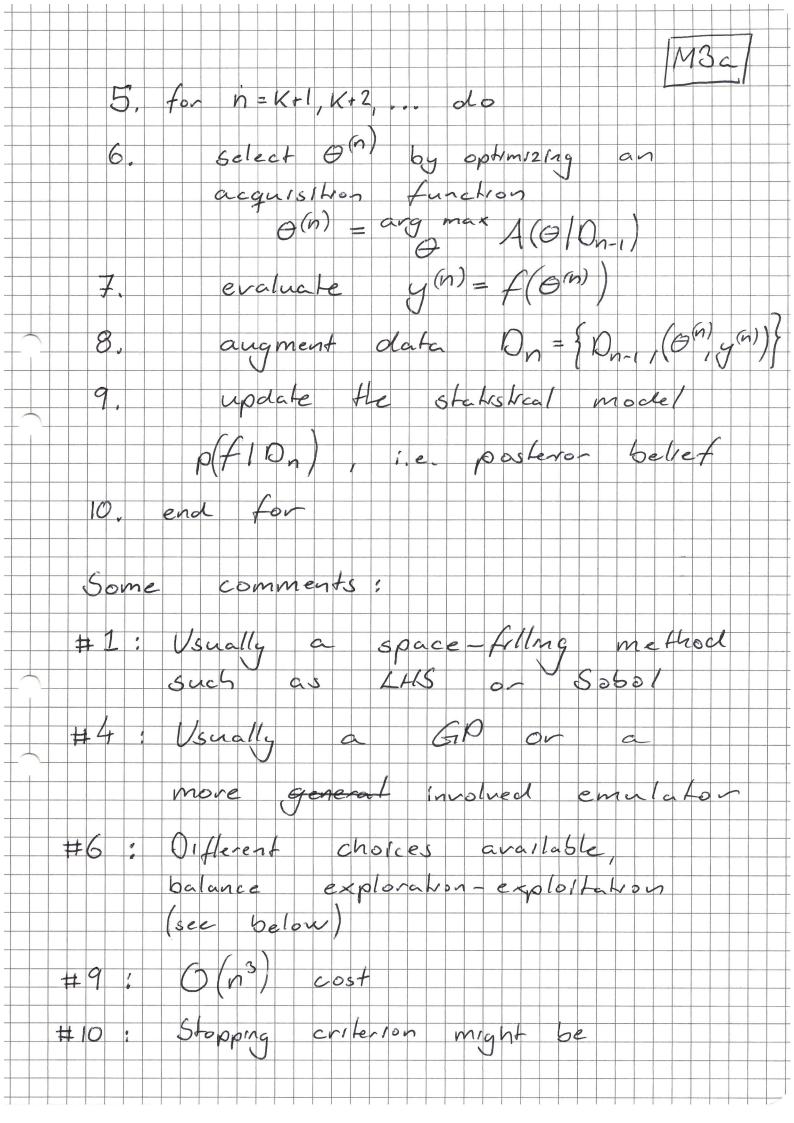


/M3a/ We need a strategy for carefully selecting a sequence of function queries Dun: {6(i), y(i)?" where y(i) = f(6(i)) Bayesian optimization Involves two main components: A/ A prior probabilishe belief p(f/D) for the function. Here we usually employ a GP This will be updated in every theator, An acquisition function A (O10)

- a heuristic that behances exploration against explositation and determines where to evaluate  $f(\theta)$  next. Pseudo-code for Bayer Opt 1. Select intral  $\Theta_{k}^{(1)}$ ,  $\Theta_{k}^{(2)}$ ,  $\Theta_{k}^{(k)}$  where  $K \ge 2$ 2. Evaluate  $A(\Theta)$  to obtain  $y_{0}^{(1)}$ ,  $y_{0}^{(2)}$ ,  $y_{0}^{(k)}$ i.e.  $f_n^{(i)} = f(f_n^{(i)})$  for i = 1, ..., K3. Initialize a data vector 0 = \$ (0(1) y(1)) \ \( j\_{i=1}^{(i)} \) 4. Select a statistical model p(7104)



a pre-defined max budget of function evaluations Acquisition functions Assume that our statistical model  $p(f/O_n) = y - N(\mu, \sigma^2),$ where  $\mu(\theta)$  and  $\sigma(\theta)$  will be gven by the covariance Anchon C(0,0') and the current data Dr Also, suppose from = min (yn) Two popular acquestion finctions: · Lower Confrdence Bound ALCO (0) = BO(0) - MO) (Maximum occurs at the B-enlarged credibility region of the GP) Often B=2 (larger means more explorative)

