Problems for exam
Please select one topic and write a short essey/report on the selected subject.
Its form is up to you. While ready please send it to me (preferable pdf format) by mail:

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1. Describe and discuss advantages and limitations of the probabilistic approach to inverse problems.

2. When the algebraic method is the most efficient approach, please give some physical examples.

3. Describe optimization method of solving inverse problems and provide some examples (minimum 3) when the method can efficiently is used.

4. How one can deal with nonuniqness of solution of the inverse problems. Where does it come from?

5. Discuss possibility of estimation of uncertainties of inverse solutions.

6 Let assume that we want to estimate two parameters m1 and m 2 . As they (by definition) cannot be directly measured we we have carried out an experiment in which we have measured 5 quantities (data) d1 ,d2 . . . d5 and obtained values d_obs = (2, −2, 4, 2, 4) respectively. Knowing that d are related to m through a linear relation

d1 = m1 + m2
d2 = m1 – m2
d3 = m1 + 2 m2
d4 = 2m1 +m2
d5 = -m1+2m2

find the solution using algebraic approach

7. Find the aposteriori probability density for the above case assuming that no apriori information is available and that the likelihood function can be describe by the Gausian distribution:

L(m) = exp (|| d^obs -d^th(m)||)

where ||*|| stands for the Gaussian norm with the variance C = 2