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What are some common machine learning interview questions?

http://www.ml-class.org

This question previously had details. They are now in a comment.

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14 Answers

Christopher Cuong Nguyen, CEO & co-founder at Arimo (née Adatao)
Answered Aug 21, 2014 · Upvoted by Alberto Bietti, PhD student in machine learning. Former ML engineer and Vladimir Novakovski, started Quora machine learning team, 2012-2014

We'd ask the following types/examples of questions, not all of which are considered pass/fail, but do give us a reasonable comprehensive picture of the candidate's depth in this area.

In general, pick one or two (that the candidate is good at) and keep going deeper and deeper, rather than go horizontally through some checklist. It is far more indicative of depth.

General mastery: when you really understand something (e.g., you've gone through the cycle of learning-doing-teaching-doing), you can express seemingly complex concepts in simple ways. Or you develop insightful views on things at a broader level and can explain it to others. E.g.,:

1. Discuss your views on the relationship between machine learning and statistics.
2. Talk about how Deep Learning (or XYZ method) fits (or not?) within the field.
3. Isn't it all just curve fitting? Talk about that.
4. How are kernel methods different?
5. Why do we need/want the bias term?
6. Why do we call it GLM when it's clearly non-linear? (somewhat tricky question, to be asked somewhat humorously---but extremely revealing.)
7. How are neural nets related to Fourier transforms? What are Fourier transforms, for that matter?
8. Etc.

ML skills specific: E.g.,

1. Pick an algorithm you like and walk me through the math and then the

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3. Discuss the meaning of the ROC curve, and write pseudo-code to generate the data for such a curve.
4. Discuss how you go about feature engineering (look for both intuition and specific evaluation techniques).
5. Etc.

Distributed systems (our needs): E.g.,

1. Discuss MapReduce (or your favorite parallelization abstraction). Why is MapReduce referred to as a "shared-nothing" architecture (clearly the nodes have to share something, no?) What are the advantages/disadvantages of "shared-nothing"?
2. Pick an algorithm. Write the pseudo-code for its parallel version.
3. What are the trade-offs between closed-form and iterative implementations of an algorithm, in the context of distributed systems?
4. Etc.

Other (hands-on experience, past accomplishments, etc.):

1. Do you have experience with R (or Weka, Scikit-learn, SAS, Spark, etc.)? Tell me what you've done with that. Write some example data pipelines in that environment.
2. Tell me about a time when you ... { worked on a project involving ML ; optimized an algorithm for performance/accuracy/etc. }
3. Estimate the amount of time in your past project spent on each segment of your data mining/machine learning work.
4. Etc.

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Alex Gilgur
The very first question under General Mastery raises questions: "Discuss your views o...

Charles H Martin, Calculation Consulting; we predict things
Answered Oct 12, 2012 · Upvoted by Ankit Sharma, Data Science Professional and Blogger at diggdata.in and Akaash Agarwal, M.Sc. Data Science & Machine Learning, University College London (2018)

When I am asked to interview people, I try to ascertain whether they know the math or not, and how to apply it in a real world context. I also look to see if they understand high performance computing and not just vanilla coding

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In our interviews, we asked a candidate to present some code they had written and to talk through it. For an ML person, it would be some kind of ML code.

So, for example, I was involved with an interview with a Physics PhD from MIT discussing some NMF code he wrote in javascript. The javascript was very good and he would be fine doing GUI work , Node.JS work, etc. Certainly not something I could do.

Can he do Machine Learning. Mind you, he has a PhD in a math heavy subject from one of the top 10 schools in the world. So he should know the math.

I wanted to see if he knew how to get it to converge properly. He did not. He knew it was non-convex, but he did not know how to seed it, nor did he know about the convex variants. He tried to give me some nonsense about it being Bi-convex and whatnot. Dude, just use Kmeans++ to seed it. Thats it. Thats all you had to say. This got totally past the VP of engineering and the CTO. (They were just impressed that machine learning involved computing a first order derivative--something neither had since since college calculus)

So here, he knew some basic methods, but did not really know the most important ideas in the field, the important developments, how to really code this. It is clear that he had never done anything like this in his former work, nor did he really understand numerical methods.

This means that his solution would never work in production and -- more importantly -- that he would have no idea how to evaluate it or how to fix it. I see this a lot. Also, he did not know the available open source codes, how they worked internally, and which one to use, or how to evaluate their performance. For being a PhD from MIT, this was unacceptable to me.

There was also a code evaluation. For me, one needs to know what runs fast and what does not. What good is a method that only runs on 300 data points?! In this case, this interviewee had written his own javascript matrix library. Did he know the BLAS libraries and how they work? Or an alternative? This is critical because you can't run anything in production if the code is too slow. I see the same problem with most ruby coders--they just don't know numerical computing.

I was not looking to evaluate 10,000 of complex code , whether he used Agile or Unit Testing. Nor did I care about solving some high school brain teaser. I just wanted to see a small piece of code, with good engineering choices , a good understanding of the math, and how to make this solution work in a modest production environment .

Id rather see old fashioned spectral clustering with a Fortran library, which can scale, as opposed to trying to use a "fancy" method like NMF or LDA if you can not get it to work in production at scale. (I'm not saying they don't scale--I am saying you better know how to get them to scale if you choose to use them)

In another interview, again a PhD (Ukrainian I think) who was very bright and had solved some good problems and had experience. He was using an off-the-

read the documentation of the tool and did you understand which parameters to tweak and which ones to leave at the default settings (I kinda would like the person to have read the entire source code of the tool and know how it works.) Again, this demonstrates a failure of the most basic mathematical concepts in ML -- Regularization-- and how they would apply in production. Tuning this parameter can increase accuracy by %10-15 (or more). Again, just simple stuff--but important stuff This also shows a lack of attention to notice the important details of the work. We actually offered this guy the job and he asked for a salary way out of the ballpark. If he had not missed this critical question he might have been able to make the case for the salary.

Having shared all this, I would add that I think , for you, the market is very good and you will probably not encounter anything like this. Why? All you need to do is know more machine learning than the VP and the CTO--and here the bar is very low. Everyone and his brother has a funding to do machine learning and they usually just need to solve one small problem and get the product out the door. Most (i.e 7/10) CTOs and VPs know absolutely nothing about even basic machine learning so they have no clue even what to ask. (Newton Raphson will blow them away, and they will think you are too expensive if you try compare stochastic gradient descent to interior point methods) They got their start up funded based on the market potential of the idea, and they are expected to hire people to invent their IP.

(Obviously if you are interviewing at Google or Lockheed Martin, disregard all of this and hire me once you get in)

P.S. I was asked once by some VP/CTO evaluating me what the volume of a rectangular prism is. AlI could think of was this old Pink Floyd album Dark Side of the Moon with the Prism on it

http://en.wikipedia.org/wiki/The...

I would never ask this kind of question but you will probably get asked many puzzle questions like this if you are fresh out of school (or an old man like me I guess) I seem to recall there are books and/or web sites with tons of these.

Good Luck

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Your response is private.

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Alex Gilgur
"I kinda would like the person to have read the entire source code of the tool ..." why? ...

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Meaghan Finneral, Recruiter
Answered Dec 20, 2015 · Upvoted by Akaash Agarwal, M.Sc. Data Science & Machine Learning, University College London (2018)

I conduct a lot of basic phone screens in this area, but I'm not a ML expert (by ANY stretch of the imagination). These Q&As I've listed are helpful to me as a recruiter.

Question: What areas of machine learning are you most familiar with?

Answers:

- supervised learning
- unsupervised learning
- anomaly detection
- active learning
- bandits
- gaussian processes
- kernel methods
- deep networks

Question: What sort of optimization problem would you be solving to train a support vector machine?

Answers: maximize margin (best answer), quadratic program, quadratic with linear constraints, reference to solving the primal or dual form.

Question: Tell me about positives and negatives of using Gaussian processes / general kernel methods approach to learning.

Answer: Positives - non-linear, non-parametric. Negatives - bad scaling with instances, need to do hyper-parameter tuning

Question: How does a kernel method scale with the number of instances (e.g. with a Gaussian rbf kernel)?

Answer: Quadratic (referring to construction of the gram (kernel) matrix), cubic (referring to the matrix inversion)

Question: Describe ways to overcome scaling issues.

Answers: nystrom methods/low-rank kernel matrix approximations, random features, local by query/near neighbors

Question: What are some tools for parallelizing machine learning algorithms?

Answers: GPUs, Matlab parfor, write your own using low level primitives/RPC/MPI, mapreduce, spark, vowpal, graphlab, giraph, petuum, parameterserver

Question: In Python, do you have a favorite/least favorite PEP?

Answer: Pep 20 as python enhancement proposal. If you have a favorite or least

Avantika G, works at Pinterview
Answered Oct 20

Machine Learning Interviews are being conducted to know whether the candidate has the in depth domain knowledge or not because this subject needs specific niche knowledge and skills. With the demand for machine learning engineers and data scientists outstripping the supply, organizations are finding it difficult to hire skilled talent and so are prospective candidates for machine learning jobs finding it difficult to crack a machine learning interview. Machine learning is a broad field and there are no specific machine learning interview questions that are likely to be asked during a machine learning engineer job interview because the machine learning interview questions asked will focus on the open job position the employer is trying to fill.

A machine learning interview is definitely not a pop quiz and one must know what to expect going in. So here are 50 top questions you might expect in the interview.

1. What is the difference between inductive machine learning and deductive machine learning?
2. How will you know which machine learning algorithm to choose for your classification problem?
3. Mention the difference between Data Mining and Machine learning?
4. What is ‘Overfitting’ in Machine learning?
5. Why overfitting happens?
6. How can you avoid overfitting?
7. Is rotation necessary in PCA? If yes, Why? What will happen if you don’t rotate the components?
8. You are given a data set. The data set has missing values which spread along 1 standard deviation from the median. What percentage of data would remain unaffected? Why?
9. Why is Naïve Bayes machine learning algorithm naïve?
10. How will you explain machine learning in to a layperson?
11. What is inductive machine learning?
12. What are the different Algorithm techniques in Machine Learning?
13. List out some important methods of reducing dimensionality.
14. Explain prior probability, likelihood and marginal likelihood in context of naïve Bayes algorithm?
15. What are the three stages to build the hypotheses or model in machine learning?

18. List down various approaches for machine learning?
19. How to know that your model is suffering from low bias and high variance. Which algorithm should you use to tackle it? Why?
20. How is kNN different from kmeans clustering?
21. Name some feature extraction techniques used for dimensionality reduction.
22. List some use cases where classification machine learning algorithms can be used.
23. What kind of problems does regularization solve?
24. How much data will you allocate for your training, validation and test sets?
25. Which one would you prefer to choose – model accuracy or model performance?
26. What is the most frequent metric to assess model accuracy for classification problems?
27. Describe some popular machine learning methods.
28. What is not Machine Learning?
29. Explain what is the function of 'Unsupervised Learning'?
30. When will you use classification over regression?
31. How will you differentiate between supervised and unsupervised learning? Give few examples of algorithms for supervised learning?
32. Explain the tradeoff between bias and variance in a regression problem.
33. What is linear regression? Why is it called linear?
34. How does the variance of the error term change with the number of predictors, in OLS?
35. Do we always need the intercept term? When do we need it and when do we not?
36. How interpretable is the given machine learning model?
37. What will you do if training results in very low accuracy?
38. Does the developed machine learning model have convergence problems?
39. Which tools and environments have you used to train and assess machine learning models?
40. How will you apply machine learning to images?
41. What is collinearity and what to do with it?
42. How to remove multicollinearity?
43. What is overfitting a regression model? What are ways to avoid it?
44. What is loss function in a Neural Network?
45. Explain the difference between MLE and MAP inference.
46. What is boosting?
47. If the gradient descent does not converge, what could be the problem?

49. How to check if the regression model fits the data well?
50. Describe some of the different splitting rules used by different decision tree algorithms.

Sri Priya, studied Masters of Business Adminstration at Avanthi Institute of Engineering and Technology, Visakhapatnam

Updated Sat

1. What are parametric models?
2. What's the trade-off between bias and variance?
3. How is KNN different from k-means clustering?
4. What is the "Curse of Dimensionality?"
5. Why is Naive Bayes machine learning algorithm naïve?
6. What is Machine learning?
7. What is 'Overfitting' in Machine learning?
8. Why overfitting happens?
9. Explain the Bias-Variance Tradeoff.
10. Explain how a ROC curve works.
11. What is the Box-Cox transformation used for?
12. What is inductive machine learning?
13. What are the five popular algorithms of Machine Learning?
14. What are the different Algorithm techniques in Machine Learning?
15. Define precision and recall.
16. What is 'Training set' and 'Test set'?
17. List down various approaches for machine learning?
18. What are 3 ways of reducing dimensionality?
19. what is the function of 'Unsupervised Learning'?
20. What is algorithm independent machine learning?
21. What is classifier in machine learning?
22. In what areas Pattern Recognition is used?
23. What is Genetic Programming?
24. What is Inductive Logic Programming in Machine Learning?

27. What is ensemble learning?
28. What are the two paradigms of ensemble methods?
29. What is PCA, KPCA and ICA used for?
30. What are support vector machines?
31. What are the different methods for Sequential Supervised Learning?
32. What is batch statistical learning?
33. What is PAC Learning?
34. What is sequence learning?
35. What are two techniques of Machine Learning ?
36. What are the advantages and disadvantages of decision trees?
37. What is Bayes' Theorem? How is it useful in a machine learning context?
38. What's a Fourier transform?
39. Describe a hash table.
40. What is bagging?

Here I have collected some interview questions on machine learning. It is not enough to have solid answers only for the above questions. For win the interview you need to be prepared for the full spectrum of questions that may be presented. For further practice, make sure you go through the required mock interview in online. I would like to suggest InterviewBuddy- https://interviewbuddy.in/ is the best tool to practice and prepare the interview with high profiled industry experts in real-time.

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Amin Suzani, Entrepreneur & Technology enthusiast
Answered Sep 6, 2017

Machine learning interview questions usually involve bringing up a real-world problem and asking the candidate how to solve it. The type of the question varies a lot depending on the field of the company.

An image processing company may ask you "how can you find all the images which are a photo of a landscape?". A video processing company may ask you "In a video of a soccer match, how can you mark all the times that a certain player is in the view?". A speech processing company may ask you "Among a large number of voicemails, how can you detect the ones that an old woman is talking?". An NLP company might ask you "How would you provide suggestions for the next word in an incomplete sentence?". An online shopping company may ask you "how would you store products in fixed-size bins where people are most likely to buy them together?".

There are so many use cases and many of these types of questions which may be asked. I suggest that before the interview you read about a few case studies

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Also, there are a few things which you are expected to know and are shared among almost all use cases. You should have ideas how to approach scenarios like this:

- How to use labeled and unlabeled data?
- What if you don't have any labeled data?
- What if your data set is skewed (e.g. 99.99 % positive and 0.01% negative labels)?
- How to test and know whether or not we have overfitting problem?
- How to avoid overfitting?
- How to make training faster?
- How to make predictions faster?

Also, It's very common in machine learning interviews that they ask you about a previous machine learning work that you have done in details. You need to be able to explain what challenges you were facing and how you solved them.

At the end, I'd like to introduce our incredible service which may be helpful for people who are preparing for machine learning interviews: It's www.techmockinterview.com . We launched this service a few months ago and it's been very well-received. You will get a mock interview experience just like the real interview. A senior machine learning engineer interviews you and provides you with feedback and the areas which you need to work on them.

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Sulakshana Iyer, I am Content writer, passionate about writing
Answered May 18, 2016

Machine learning is a division of computer science which deals with system programming to automatically learn and develop with experience. Machine Learning is generally related to artificial intelligence (AI) that provides computers with the ability to do some tasks, such as planning, robot control,recognition, prediction, diagnosis, and more, that too without being clearly programmed. It basically focuses on the development of algorithms that can recommend them to grow and improve when exposed to the new dataset.

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1. Tell us the difference between Machine learning and Data Mining?

2. In machine learning – what is overfitting and why does it happen?

3. What are some ways to prevent overfitting?

4. Can you tell us a few popular Machine learning algorithms?

5. What are the different Machine learning algorithm techniques?

6. What are different Machine learning approaches?

7. What would you not include in Machine learning?

8. Tell us the difference between Machine learning and Artificial intelligence?

9. What is Genetic programming?

10. What are support vector machines?

11. What are two important techniques of Machine Learning?

12. Give us a common application of machine learning that you get to see on a daily basis?

These are just a few questions out of the hoard of machine learning interview questions. It's not an exhaustive list, however, prepare for these questions too and give your shot confidently.

All the best!

Nathan Artz, CTO @ Real Life Sciences (https://www.rlsciences.com)
Answered May 26, 2014

I think a lot of people dont know how to properly conduct a data science interview - mostly because they dont understand what to look for themselves - how do you ask someone about something you know very little about?

First off, Data Scientist is going to be an EXTREMELY different position for a startup vs a large company (i.e. GOOGLE / IBM Research). Most likely, for a large organization, the problems you'll be focusing on are a bit more constrained, versus in a startup, it will probably be like "we need a first version of classification / recommendation / etc" models.

In a startup, you'll more likely than not want someone who has both data wrangling skills (depending, Pig / Python / SQL etc) as well as having used standard ML libraries, although this will **somewhat** apply to a large company. The thing is, the large company has resources to do more novel exploration, whereas few startups will take risks to invent something completely novel.

Anyway, the right way to conduct a data science interview is to create a dataset (i.e. from a Kaggle, etc) that resembles the problem you want to solve, and have

what data would they choose?
how would they clean the data?
What types of features? How could features be enhanced with domain knowledge?
what model would they use? why / why not?
what evaluation metrics? (f1 / recall / precision, etc)
What are other papers saying about this? What is the academic benchmark for a problem like this?
Who in academia has presented papers on this type of problem?
etc.

Mike West
Answered Jan 11

Start here. **These are part of my phone screen.** If you can't get through the basics in the language you'll be using every day then you can't do any of the hard stuff.

Most never make it past the basics. **If you can't wrangle your own data there's no reason to discuss modeling.**

Q: What's a variable?

A: Variables are nothing but reserved memory locations to store values. This means that when you create a variable you reserve some space in memory.

Q: What do we use to assign a value to a variable?

A: An equals sign.

Q: How do you set two variables equal to one another?

A: A double equals sign.

Q: What is one way to comment our code in Python?

A: Place a pound sign in front of the text of our comment.

Q: What's one way to name our variables?

A: Camel case or underscores.

Q: What data type do we use in Python to store text?

A: Strings

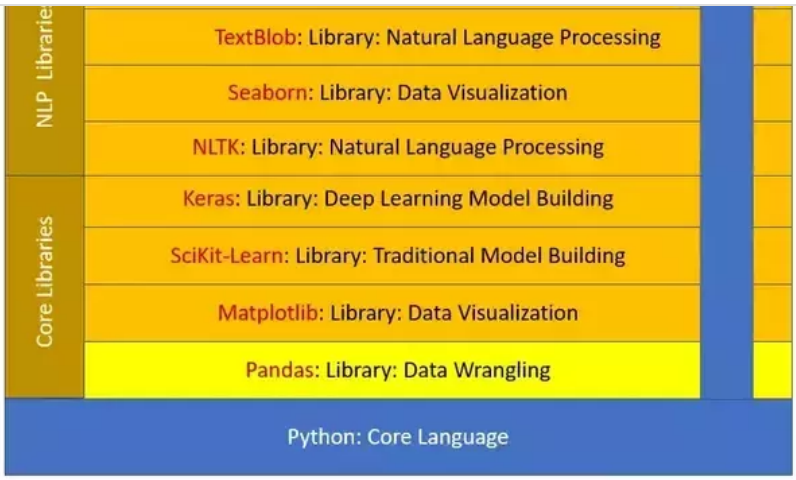
Q: What are the two numeric data types in Python?

A: Integers and floats.

Q: What's a float?

A: A number with a decimal in it.

Use the pic below as a guide line for applied machine learning. You'll need to know the basics in Python really well then you'll need to know the core libraries



Start here: The Complete Python Course for Machine Learning Engineers

The course is free and it will show what machine learning engineers do all day.

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Yuval Kesten
Answered Jan 28, 2012

I think that your interviewers will want to see some experience in ML.
I guess that this is your first job in this domain so I would suggest working on a small-medium independent open source project which will be "cool" and based upon an ML algo'.
Something like a facebook app, mobile app, small web site.
This will give you that needed edge over other newbies.
By doing so, there is a good chance that they will spend some of the interview time by asking you about your project, which you will know well, instead of asking you more and more "tricky" questions..Good luck!

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Saanvi Priya
Answered Dec 26

To help you to prepare for an interview i have prepared some of questions to make your interview as simple.there is the most commonly used questions in machine learning

1.Explain about naive Bayes so naive?.

2.How you know your model is suffering and how you overcome that with an algorithm and explain it?.

3.Write an equation related to recall related and true positive rate?.

4.What you know about sampling and splitting ?.

5. Advantages of neutral network ?

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7. How is kNN different from kmeans clustering?.

8. How is True Positive Rate and Recall related? Write the equation?.

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Ani Rud, Blogger at Analyticscosm
Answered Mar 11, 2016

Some questions that are typically asked are generic ML questions and based on your answers you may be asked specific questions. Also, depends on the knack of the interviewer. If he/she has something very specific in mind that'll surely be asked.

Here is a compilations of a wide variety of questions: Collection of Machine Learning Interview Questions that are usually asked in interviews.

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Anonymous
Answered May 31, 2017

Unfortunately they ask a lot of data structures and algorithm questions too which has nothing to do with machine learning or even software engineering. They are so hard they could fail you from the rest of the interview.

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Lawrence Chernin, Founder of Brainiac Dating - connecting intelligent singles. http://BrainiacDating.com
Answered May 18, 2014

1) How to assess the quality of clustering, especially to know when you have the right number of clusters
2) How do you pick the features to use
3) There would probably also be a lot of statistics questions such as what is an F-test

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2 Answers Collapsed (Why?)

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