Applied Researcher Interview Guidelines - 2020Q2

We are hiring strongly qualified candidates for Applied Researcher at levels 25-27. The job descriptions are listed in the Appendix. The candidates we seek will help us build the science infrastructure behind a new CPC advertising infrastructure. We want to hire candidates which are listed as “above expectations” below and should raise the overall average within the team.

The hiring process follows the eBay standard practice [[1](https://careers.ebayinc.com/how-we-hire/%E2%80%A9)]. Candidates will pass through 2 phone interviews and an onsite. The responsibilities for each interview are as follows:

Phone Screen 1: Covers ML Breadth and maybe details about the candidate’s background

Phone Screen 2: Covers coding fundamentals with a little less on ML

Onsite: Mix of ML depth, applications, and breadth, coding, and behavioral questions [[2](https://hub.corp.ebay.com/site/people/page/manage-interview-question-library/us/manager)].

In the days of shelter-at-home, all interviews are virtual, but we expect the onsite to occur all within one day.

For Applied Researchers, we generally seek candidates who have already accomplished scientific research and are interested in doing practical work to deliver values to our buyers and sellers. These positions attract candidates who passion and interest in machine learning can surpass their abilities, and the interview process is how we identify candidates who know what they are talking about vs candidates like talking. The table below highlights the competency targets for each level.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Applied Researcher 2** | **Applied Researcher 3** | **Sr. Applied Researcher** |
| **Domain experience (e.g., Ads)** | No | Some familiarity | Yes |
| **Breadth** | Knows the algorithms in detail, derives them, and clearly discusses tradeoffs | Knows the algorithms in detail and can tailor models to adjust for tradeoffs | Clearly has had experience with multiple models and can provide practical guidance for picking some over others |
| **Depth** | Detailed derivation for the proposed model, good understanding of parameters and overfitting | Detailed derivations and discusses pros and cons of different strategies for the model with recommendations | Good practical experience with at least some models, explains their decisions from experience in multiple projects |
| **Applications** | Walks through hypothetical applications and may have some experience. Asks clarifying questions. | Has clearly done this before and if not, can easily foresee problems and provide solutions. Asks questions and provides recommendations. | Multiple project experience, transfer learnings across projects, calls out problems and solutions. Asks questions, recommends, and thinks through multiple components. |
| **Coding** | Can write correct and logical code easily, | Writes clean and well-structured code | Writes clean and well-structured code |

# Applied Researcher Competencies

Assessing each component, though varying by level, roughly falls into four major areas. This is in addition to behavioral questions [[2](https://hub.corp.ebay.com/site/people/page/manage-interview-question-library/us/manager)]. The technical competencies are as follows:

### Machine Learning Breadth

In assessing breadth, we test the candidate’s flexibility in applying multiple techniques to a hypothetical problem statement. We must differentiate in the interview whether the candidate knows the method deeply, has merely read the documentation, or has just heard of the algorithm during the interview. A typical breadth interview session begins with the interviewer posing a business case study and guides the candidate towards a modeling solution. The interviewer should guide the candidate into medium-level detail on at least 3-4 different learning methods. Candidates should be able to describe how the algorithms work, details on how to solve the learning problem, and a very clear understanding of pros and cons, tradeoffs and applicability. Candidates can be graded as follows:

**Below expectations**. Candidate knows the terms, but introduces keywords or buzzwords without clearly explaining them or the details. They may say “use decision tree” but cannot explain how a decision works or why it would be preferred as opposed to something else. They may get lost in derivations beyond a certain point.

**At expectations**. The candidate can explain the algorithms to certain detail and may have worked with some of these algorithms. Candidates can derive some of the models, may be a little lacking on clear pros and cons, but if they read a little more, they would probably figure it out.

**Above expectations**. Candidate knows the algorithms in detail, they can write out the formulas, explain the models, and explain tuning and pros and cons quite well. Candidates can easily discuss one model from another. It is clear the candidate could implement the model if they had to.

### Machine Learning Depth

In assessing depth, we test the candidate’s problem solving capabilities and ability to handle constraints within a single solution. We want to know whether the candidate knows how to call a library to train a model or design new learning algorithms for our problems. In a depth session, the interviewer poses a business problem and asks the candidate to build the ML solution. This will typically involve a single learning algorithm, which the interviewer will probe the candidate about key aspects of the solution: model setup, training, evaluation, overfitting, parameter tuning, deployment, online evaluation and verification, etc.

**Below expectations**. Candidate can explain how to train the model, maybe has done this before on some toy datasets using pre-built packages. However, they are unable to derive good features that work for the model or cannot derive the full optimization function. May not be able to explain how to detect and combat overfitting.

**At expectations**. Candidates can derive the function, they may miss points like parameter tuning, full implications of overfitting and how to address it. They may get some details wrong or miss some non-trivial points.

**Above expectations**. Candidate derives the full optimization function and can compare different training techniques. They provide clear guidance on how to tune parameters, clearly explain why different evaluation metrics make sense. Provide good theoretical justification for correcting for overfitting and convergence.

### Applying Machine Learning

In the applications part of the interview, we are assessing whether the candidate has experience in industrial ML research. The interviewer presents a business problem and the candidate should design a solution. The interviewer guides the candidate towards the more practical aspects of modeling, focusing on how to implement features, how to build training pipelines, building online inference, A/B testing and what can go wrong.

**Below expectations**. Candidate has clearly never done this before and has no idea how to proceed. Interviewers may need to offer lots of hits, but candidates make unsubstantiated claims on systems capabilities. For example, showing no concern about the need to retraining or online evaluation latency.

**At expectations**. Candidate has done this a few times and can explain possibly with some examples. There may be a few gaps such as the candidate has not had to get their own data or do a lot of analysis. They may rely on dashboards alone without detailed understanding of model performance.

**Above expectations**. Candidate has clear experience and describes the challenges and solutions with ease. They are able to articulate where problems may arise and how to solve them. They offer alternative strategies, but recommend a specific one. They worry about how to evaluate the solution.

### Coding for Applied Researchers

We expect our Applied Researchers to be able to write high-quality code. Perhaps not within production servers but certainly within data pipelines which run on a frequent basis. The coding interview should focus on fundamentals but, especially for candidates not with a CS background, we may focus on ML coding questions. Some examples include: Matrix or vector products: dense, sparse, distributed. Data operations like aggregations by key, joins, group statistics. Algorithm implementations: nearest neighbor search, inverted index retrieval, decision tree evaluation. Although the questions may be ML heavy, we apply similar guidelines to traditional engineering roles.

**Below expectations**. Candidate struggles with basic data structures, using a hash table, classes, etc. They may get the math right, but we can’t trust them to write even basic code. Or, for engineering candidates, they write syntactically beautiful code but have no clue how to solve the algorithmic problem.

**At expectations**. Candidate should know the solution reasonably well and have a good first pass. They may be able to handle extra twists to make the problem more challenging. The code may be a little messy. We might not want them anywhere near the servers.

**Above expectations**. Candidate knows the solution and can suggest improvements directly. Code is clean and well structured. If simplifying assumptions are made, they are called out and can be deep-dived if needed.

# Appendix

## Further Reading

[[1](https://careers.ebayinc.com/how-we-hire/%E2%80%A9)] Official guidelines: https://careers.ebayinc.com/how-we-hire/

[[2](https://hub.corp.ebay.com/site/people/page/manage-interview-question-library/us/manager)] Behavioral interview questions:

## Applied Researcher 2 - T25 Job Description

Link: <https://jobs.ebayinc.com/job/san-jose/applied-researcher-2/403/16075093>

Looking to make an impact on the future of global commerce? Do you want to shape how millions of people buy, sell, and engage around the world?

The Search Monetization team is the biggest contributor to eBay’s advertising program. We innovate at the heart of ecommerce search and advertising, with the ambitious goal of redefining ecommerce advertising. We craft optimized experiences for buyers and sellers on eBay. We innovate rapidly in this space and there is no shortage of new challenges for motivated individuals.

We are looking for stellar applied researchers to join us and build the next generation of online advertising products in eBay search. If you enjoy the scale and technical complexity of advertising and want to be at the frontier of applied research in advertising in e-commerce, join now. Help us redefine advertising at eBay.

### Job Responsibilities

* Seek scientifically valid solutions that deliver real value to eBay customers
* Build machine learning models and data pipelines to deliver insightful yet practical solutions
* Work with multiple teams to help promote standard scientific methodologies and processes in your field
* Present key technical and novel research work in public forums and conferences

### Basic Qualifications

* MS or PhD in Computer Science, Statistics, Mathematics, or equivalent
* 1-3 years (with PhD) or 3-5 years (with MS) of industrial experience in a related field
* Industrial experience with one or more of the following: classification, regression, recommendation systems, targeting systems, ranking systems, fraud detection, online advertising, or related
* Experience in big data processing, e.g. Hadoop, SQL, Spark
* Experience with Python or R, and Java or Scala or C/C++
* 2 or more related publications in quality conferences or journals

## Applied Researcher 3 - T26 Job Description

Link: TBD

Looking to make an impact on the future of global commerce? Do you want to shape how millions of people buy, sell, and engage around the world?

The Search Monetization team is the biggest contributor to eBay’s advertising program. We innovate at the heart of ecommerce search and advertising, with the ambitious goal of redefining ecommerce advertising. We craft an optimized experience for both buyers and sellers on eBay. We innovate rapidly in this space and there is no shortage of new challenges for motivated individuals.

We are looking for stellar applied researchers to join us and build the next generation of online advertising products in eBay search. If you enjoy the scale and technical complexity of advertising and want to be at the frontier of applied research in advertising in e-commerce, join now. Help us redefine advertising at eBay.

### Job Responsibilities

* Seek scientific solutions to highly ambiguous problems by crafting a technical vision and building consensus across teams
* Think through complex research problems, simplify where necessary, invent when needed, to drive a principled vision from thought to reality
* Drive technical vision, promote standard methodologies, and establish processes in your field across teams
* Present key technical and novel research work in public forums and conferences
* Mentor junior team members

### Basic Qualifications

* MS or PhD in Computer Science, Statistics, Mathematics, or equivalent
* 3-5 years (with PhD) or 5-8 years (with MS) of industrial experience in a related field
* Strong Industrial experience with one or more of the following: classification, regression, recommendation systems, targeting systems, ranking systems, fraud detection, online advertising, or related
* Experience in big data processing, e.g. Hadoop, SQL, Spark
* Experience with Python or R, and Java or Scala or C/C++
* 2 or more related publications in quality conferences or journals

## Sr. Applied Researcher - T27 Job Description

Link: <https://jobs.ebayinc.com/job/san-jose/senior-applied-researcher/403/16067463>

Looking to make an impact on the future of global commerce? Do you want to shape how millions of people buy, sell, and engage around the world?

The Search Monetization team is the biggest contributor to eBay’s advertising program. We innovate at the heart of ecommerce search and advertising, with the ambitious goal of redefining ecommerce advertising. We craft an optimized experience for both buyers and sellers on eBay. We innovate rapidly in this space and there is no shortage of new challenges for motivated individuals.

We are looking for stellar applied researchers to join us and build the next generation of online advertising products in eBay search. If you enjoy the scale and technical complexity of advertising and want to be at the frontier of applied research in advertising in e-commerce, join now. Help us redefine advertising at eBay.

### Job Responsibilities

* Seek scientific solutions to multiple complex and ambiguous problems by crafting a technical vision and driving consensus across teams
* Think through complex research problems, simplify where necessary, invent when needed, to drive a principled vision from thought to reality
* Work through others as a technical leader to drive vision, define and standardize methodologies, establish processes, and operationalize machine learning solutions across teams and projects
* Present key technical and novel research work in public forums and conferences
* Mentor junior team members

### Basic Qualifications

* MS or PhD in Computer Science, Statistics, Mathematics, or equivalent
* 5-8 years (with PhD) or 8-12 years (with MS) of industrial experience in a related field
* Strong Industrial experience with one or more of the following: classification, regression, recommendation systems, targeting systems, ranking systems, fraud detection, online advertising, or related
* Experience in big data processing, e.g. Hadoop, SQL, Spark
* Experience with Python or R, and Java or Scala or C/C++
* 2 or more related publications in quality conferences or journals