

MBAi 448 | Winter 2026

AI Fundamentals

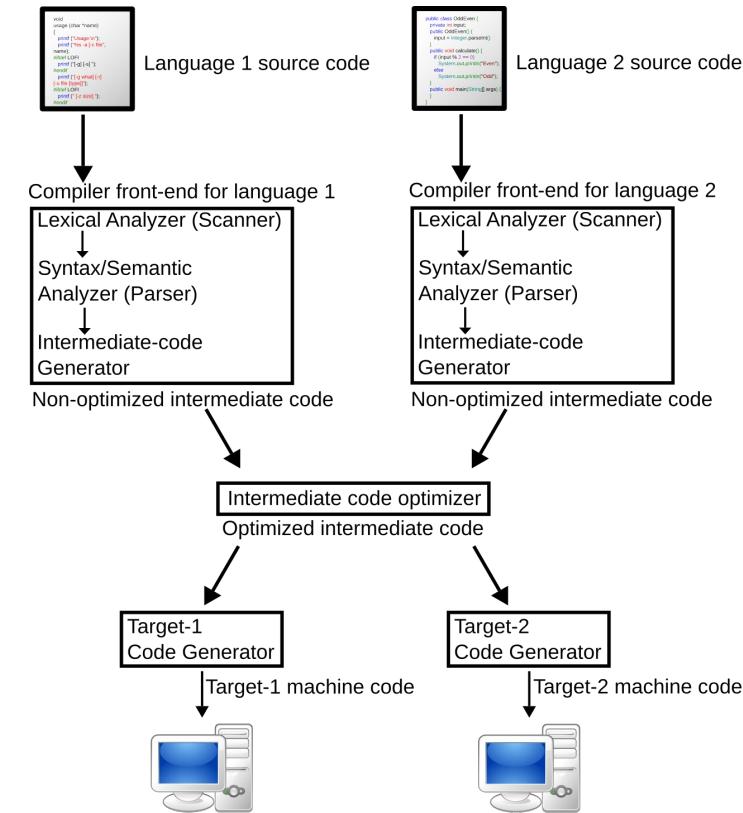
Today

- Assignment 2 takeaways *10 minutes*
- Representing task knowledge *15 minutes*
- AI fundamentals case studies *20 minutes*
- Quick break *5 minutes*
- Ask an AI model *15 minutes*
- Assignment walkthrough *20 minutes*

Representing task knowledge

AI Fundamentals

Knowledge as a series of rules



If only it were that easy

MCCARTHY Cyc KB Browser - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print

Address : http://opencyc25.homelinux.org:3603/cg?cb-start

Update Tools Nav Opt Login Guest Machine: mccarthy

Complete Vehicle Clear Show

RoadVehicle

Index

Viewpoint Filters :

[Create Similar] [Rename] [Merge] [Kill]
[Force TMS] [Lexify] [EL Formulas]

Documentation
Definitional Info
Lexical Info (8)
Applicable Relations

All Asserted Knowledge (33)

All KB Assertions (33)

All GAFs (32)

Arg 1 (15)

isa (5)

BaseKB (3)

TransportationVocabularyMt (2)

genls (4)

disjointWith

comment

genPhrase (2)

clarifyingCollection

commonlyExternalConcept

Collection : RoadVehicle

GAF Arg : 1

Mt : BaseKB
isa : PublicConstant-DefinitionalGAFsOK PublicConstant-CommentOK PublicConstant

Mt : TransportationVocabularyMt
isa : ExistingObjectType ProductType
genls : WheeledVehicle TransportationDevice-Vehicle LandTransportationDevice TransportationContainerProduct

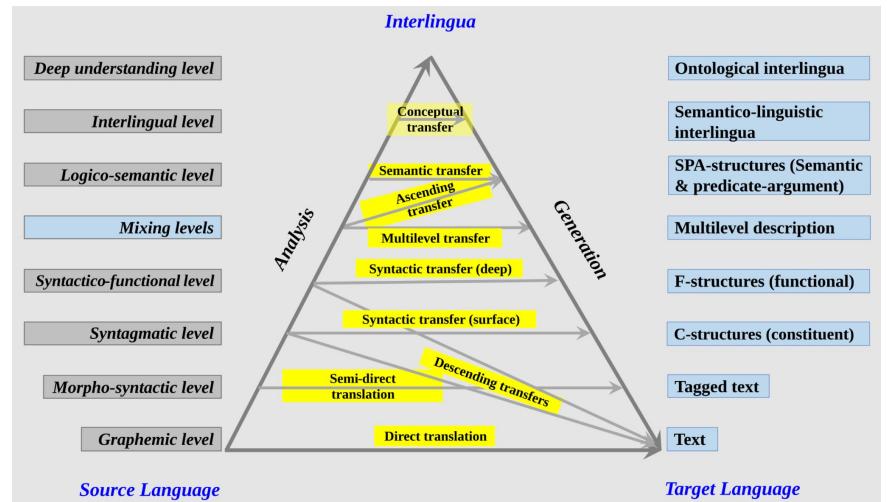
Mt : ProductGVocabularyMt
disjointWith : TrainEngine

Mt : TransportationVocabularyMt
comment : "A specialization of both LandTransportationDevice and TransportationDevice-Vehicle. Each instance of RoadVehicle is a vehicle designed primarily for travel on roads (although some instances may also have limited off-road capabilities). Notable specializations of RoadVehicle include Automobile, Truck, and Bus-RoadVehicle. Since RoadVehicle is a specialization of TransportationDevice-Vehicle, each instance of RoadVehicle is self-powered. Consequently, road transportation devices which are not self-powered (for example, all the instances of Bicycle) are not included in this collection."

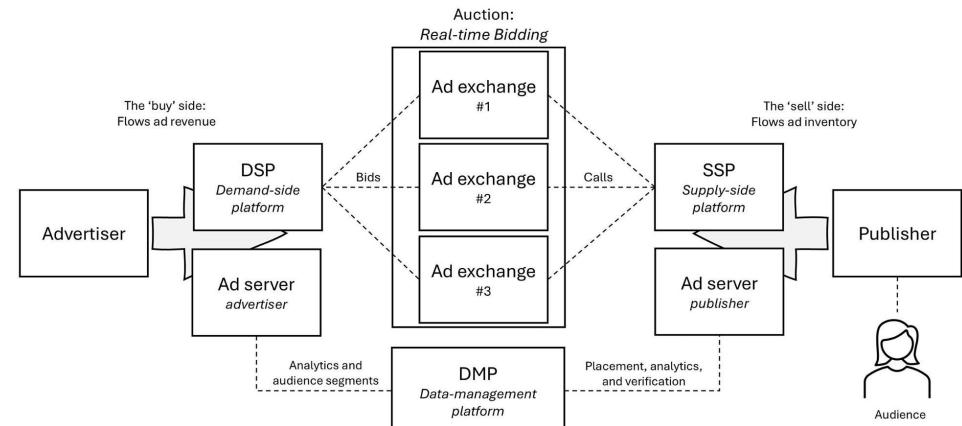
Mt : EnglishParaphraseMt

Update Comm: Storing Only Agenda: Sleep KB: 534 System: 1.2277

Start TODO.txt - Notepad freshmeat.net: Proj... OpenCyc - Microsoft ... MCCARTHY Cyc KB ... TURING Cyc KB Brow... Vauquois 4:52 PM



Knowledge as heuristics and objectives

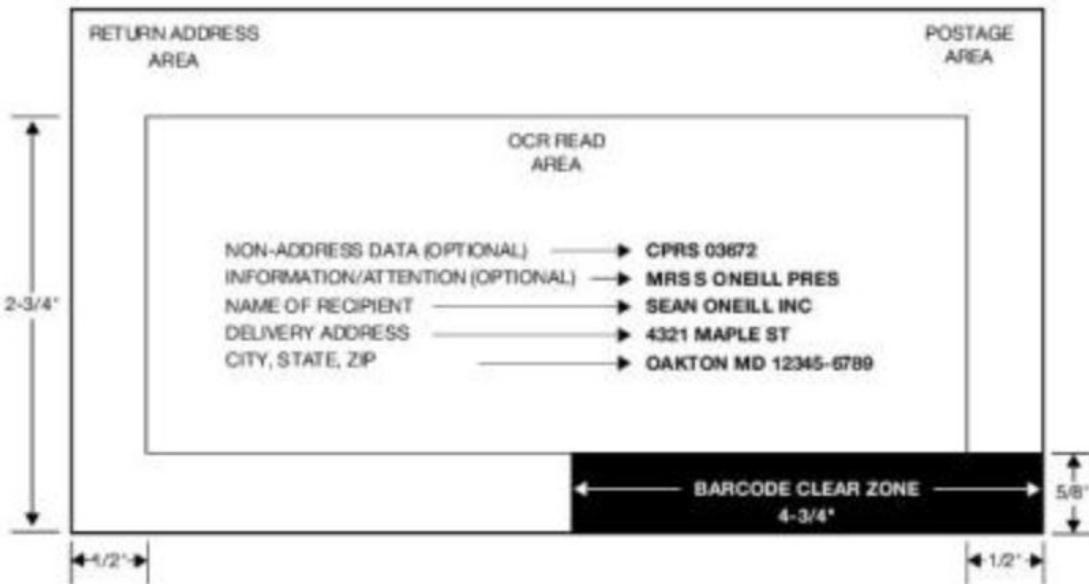


Developing good heuristics is hard

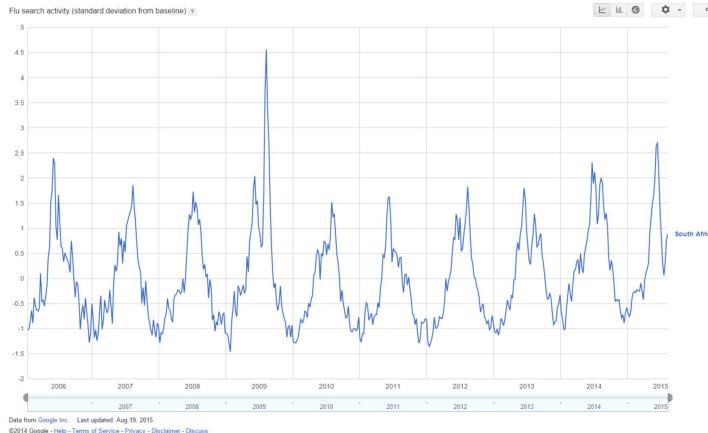
The false alarm was apparently set off when the satellite mistook the sun's reflection off the tops of clouds for a missile launch. The computer program that was supposed to filter out such information had to be rewritten.

Colonel Petrov said the system had been rushed into service in response to the United States' introduction of a similar system. He said he knew it was not 100 percent reliable.

Knowledge as the outcome of learning



Experience isn't always the best teacher



That is because Amazon's computer models were trained to vet applicants by observing patterns in résumés submitted to the company over a 10-year period. Most came from men, a reflection of male dominance across the tech industry.

In effect, Amazon's system taught itself that male candidates were preferable. It penalized résumés that included the word "women's", as in "women's chess club captain". And it downgraded graduates of two all-women's colleges, according to people familiar with the matter.

Amazon edited the programs to make them neutral to these particular terms.

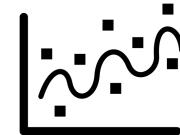
Major AI systems are often hybrids



Rules



Heuristics



Learning

There is no free lunch



AI fundamentals case studies

AI Fundamentals

Case Study: TurboTax

Problem

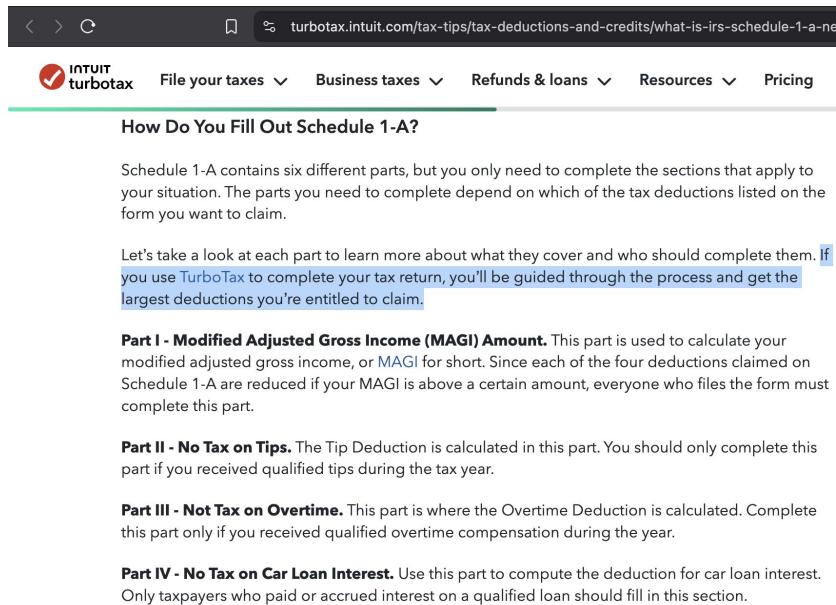
- Individuals must file taxes, but the tax code is large and complex

Task Knowledge Represented As

- Rules

Case Study: TurboTax

Task Knowledge Represented As: Rules



The screenshot shows a web browser with the URL turbotax.intuit.com/tax-tips/tax-deductions-and-credits/what-is-irs-schedule-1-a-new-2025-form-for-additional-deductions-explained/. The page title is "How Do You Fill Out Schedule 1-A?". The content discusses the six parts of Schedule 1-A and provides tips for completing them using TurboTax. It also details four parts: Modified Adjusted Gross Income (MAGI), No Tax on Tips, Not Tax on Overtime, and No Tax on Car Loan Interest.

How Do You Fill Out Schedule 1-A?

Schedule 1-A contains six different parts, but you only need to complete the sections that apply to your situation. The parts you need to complete depend on which of the tax deductions listed on the form you want to claim.

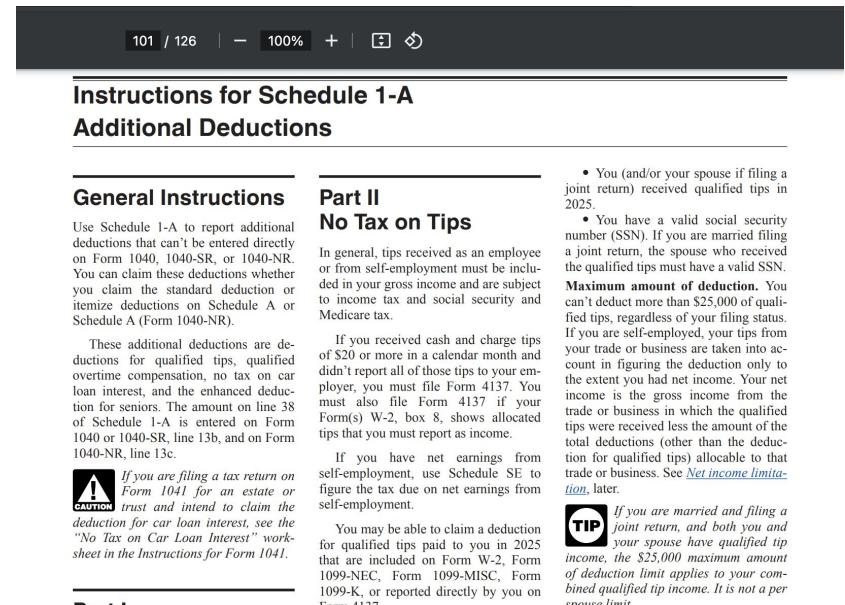
Let's take a look at each part to learn more about what they cover and who should complete them. If you use TurboTax to complete your tax return, you'll be guided through the process and get the largest deductions you're entitled to claim.

Part I - Modified Adjusted Gross Income (MAGI) Amount. This part is used to calculate your modified adjusted gross income, or MAGI for short. Since each of the four deductions claimed on Schedule 1-A are reduced if your MAGI is above a certain amount, everyone who files the form must complete this part.

Part II - No Tax on Tips. The Tip Deduction is calculated in this part. You should only complete this part if you received qualified tips during the tax year.

Part III - Not Tax on Overtime. This part is where the Overtime Deduction is calculated. Complete this part only if you received qualified overtime compensation during the year.

Part IV - No Tax on Car Loan Interest. Use this part to compute the deduction for car loan interest. Only taxpayers who paid or accrued interest on a qualified loan should fill in this section.



The screenshot shows a web browser with the URL <https://www.irs.gov/pub/irs-pdf/f1040gi.pdf>. The page title is "Instructions for Schedule 1-A Additional Deductions". It includes sections for General Instructions, Part II (No Tax on Tips), and Part III (Not Tax on Overtime). It also features a TIP box and a CAUTION box.

Instructions for Schedule 1-A

Additional Deductions

General Instructions

Use Schedule 1-A to report additional deductions that can't be entered directly on Form 1040, 1040-SR, or 1040-NR. You can claim these deductions whether you claim the standard deduction or itemize deductions on Schedule A or Schedule A (Form 1040-NR).

These additional deductions are deductions for qualified tips, qualified overtime compensation, no tax on car loan interest, and the enhanced deduction for seniors. The amount on line 38 of Schedule 1-A is entered on Form 1040 or 1040-SR, line 13b, and on Form 1040-NR, line 13c.

If you received cash and charge tips of \$20 or more in a calendar month and didn't report all of those tips to your employer, you must file Form 4137. You must also file Form 4137 if your Form(s) W-2, box 8, shows allocated tips that you must report as income.

If you have net earnings from self-employment, use Schedule SE to figure the tax due on net earnings from self-employment.

You may be able to claim a deduction for qualified tips paid to you in 2025 that are included on Form W-2, Form 1099-NEC, Form 1099-MISC, Form 1099-K, or reported directly by you on Form 4137.

Part II

No Tax on Tips

In general, tips received as an employee or from self-employment must be included in your gross income and are subject to income tax and social security and Medicare tax.

CAUTION If you are filing a tax return on Form 1041 for an estate or trust and intend to claim the deduction for car loan interest, see the "No Tax on Car Loan Interest" worksheet in the Instructions for Form 1041.

Part III

TIP If you are married and filing a joint return, and both you and your spouse have qualified tip income, the \$25,000 maximum amount of deduction limit applies to your combined qualified tip income. It is not a per spouse limit.

Case Study: TurboTax

Requirements

- Human tax experts must manually update rules each year
- Judgement questions handled separately (contact a tax expert)

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Case Study: Airline Scheduling

Problem

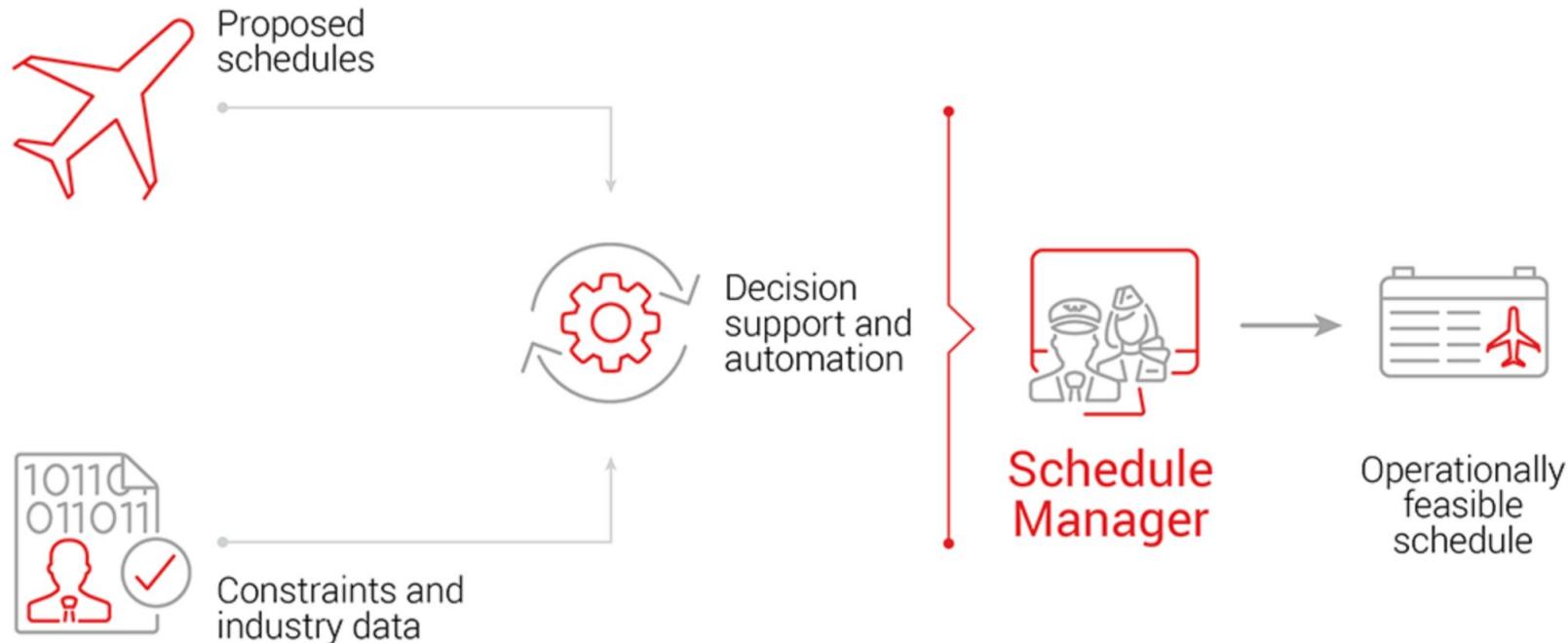
- Scheduling demands exceed human capacity at scale and speed

Task Knowledge Represented As

- Heuristics (and rules)

Case Study: Airline Scheduling

Task Knowledge Represented As: Heuristics (and rules)



Case Study: Airline Scheduling

Requirements

- Identification and encoding of key scheduling priorities
- Systems that could operate reliably on an ongoing basis in real time

Impact

-

Case Study: IBM Watson

Problem

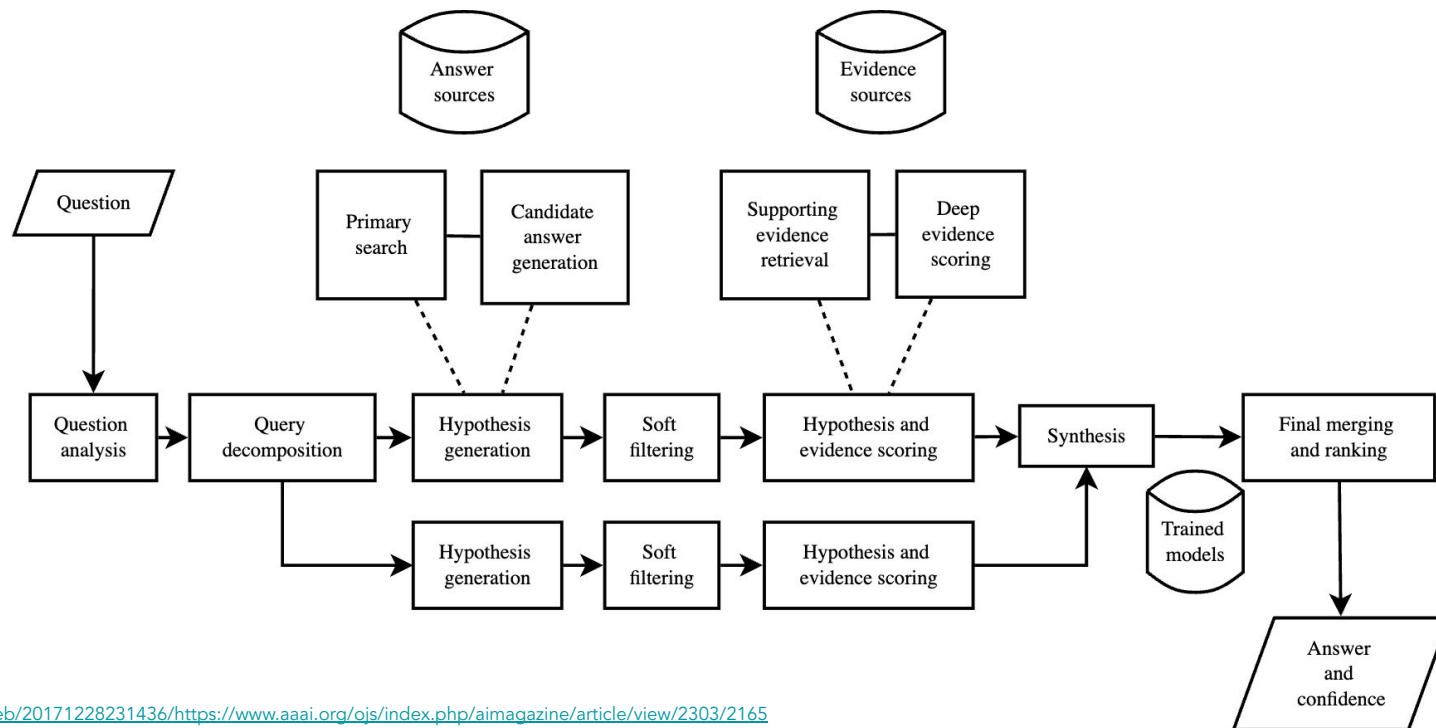
- Jeopardy! seemed to be a human pursuit, beyond what a machine could do

Task Knowledge Represented As

- Learning (and heuristics (and rules))

Case Study: IBM Watson

Task Knowledge Represented As: Learning (and heuristics (and rules))



Case Study: IBM Watson

Requirements

- Years of development with a dedicated, cross-functional research team
- Singular focus on rapidly responding to general knowledge questions
- Ensemble approaches employed in structured, modular orchestration

Impact

-

Ask an AI model

AI Fundamentals

Getting AI to think with you, not for you



Stay mindful of bias



Question solutions



Expand your perspectives



**Spot weaknesses or
vulnerabilities**



**Start with your own
ideas**

Assignment walkthrough

AI Fundamentals