

Below, I report a few ideas for projects:

Project 1: Automated Recommendations:

The objective of this project is to use Agentic AI to construct an analyst recommender system. Students would leverage the IBES dataset provided by LSEG and available from the WRDS. Please go to the folder Data/WRDS in Courseworks, and read the PDF file describing how to access data.

Below is a snapshot of how the IBES data set looks like:

TICKER	CUSIP	CNAME	OFTIC	ACTDATS	ESTIMID	ANALYST	ERECCD	ETEXT	IRECCD	ITEXT	EMASKCD	AMASKCD	USFIRM	AC7
NVDA	67066G10	NVIDIA CORP	NVDA	2000-04-18	MORGAN	EDELSTONE M		STRONG BUY	1	STRONG BUY	1595	5527	1	10:4
NVDA	67066G10	NVIDIA CORP	NVDA	2000-06-22	BACHE		SB	STRONG BUY	1	STRONG BUY	148	0	1	15:2
NVDA	67066G10	NVIDIA CORP	NVDA	2000-08-23	VOLPE	MOSESMAHON H	1	STRONG BUY	1	STRONG BUY	148	40196	1	16:3
NVDA	67066G10	NVIDIA CORP	NVDA	2000-08-31	SUTRO	LIN J	1	BUY	1	STRONG BUY	2242	46167	1	10:4
NVDA	67066G10	NVIDIA CORP	NVDA	2000-10-12	WEISEL	ROSS E		OUTPERFORM	2	BUY	4451	48085	1	11:4
NVDA	67066G10	NVIDIA CORP	NVDA	2000-11-16	BACHE		SB	STRONG BUY	1	STRONG BUY	148	0	1	13:2
NVDA	67066G10	NVIDIA CORP	NVDA	2000-12-06	BACHE		3	HOLD	3	HOLD	148	0	1	11:5
NVDA	67066G10	NVIDIA CORP	NVDA	2001-01-05	BUCK	LABEL P	1	STRONG BUY	1	STRONG BUY	356	678	1	13:1
NVDA	67066G10	NVIDIA CORP	NVDA	2001-03-15	BACHE		SB	STRONG BUY	1	STRONG BUY	148	0	1	9:56
NVDA	67066G10	NVIDIA CORP	NVDA	2001-03-23	DEACON	HODGSON D	2	BUY	2	BUY	704	71794	1	11:3
NVDA	67066G10	NVIDIA CORP	NVDA	2001-05-02	MORGAN	EDELSTONE M		OUTPERFORM	2	BUY	1595	5527	1	17:5
NVDA	67066G10	NVIDIA CORP	NVDA	2001-05-09	MORGAN	EDELSTONE M		STRONG BUY	1	STRONG BUY	1595	5527	1	11:2
NVDA	67066G10	NVIDIA CORP	NVDA	2001-05-23	BUCK	LABEL P	2	ACCUMULATE	2	BUY	356	678	1	12:2
NVDA	67066G10	NVIDIA CORP	NVDA	2001-08-03	ROTHSON	ROTHDEUTSCH E	BUY	BUY	2	BUY	1932	47811	1	12:3
NVDA	67066G10	NVIDIA CORP	NVDA	2001-11-12	NUTMEG		BUY	BUY	1	STRONG BUY	1720	0	1	11:1
NVDA	67066G10	NVIDIA CORP	NVDA	2001-11-19	MERRILL		1	STRONG BUY	1	STRONG BUY	1534	0	1	9:20
NVDA	67066G10	NVIDIA CORP	NVDA	2001-11-21	WEISEL	ROSS E		OUTPERFORM	2	BUY	4451	48085	1	12:3
NVDA	67066G10	NVIDIA CORP	NVDA	2001-12-04	BACHE	MOSESMAHON H	1	BUY	1	STRONG BUY	148	40196	1	12:5
NVDA	67066G10	NVIDIA CORP	NVDA	2002-01-15	DEACON	HODGSON D	2	BUY	2	BUY	704	71794	1	13:1
NVDA	67066G10	NVIDIA CORP	NVDA	2002-02-01	GOLDMAN		2	MKT OUTPERFORMER	2	BUY	1020	0	1	14:5
NVDA	67066G10	NVIDIA CORP	NVDA	2002-02-11	FBOSTON	MAHON T	B	BUY	2	BUY	846	51906	1	18:1

You would intersect data with other relevant sources of their choice, including news, past stock data, and correlations. For news, you can use the Compustat Capital IQ – Key Developments (here is a snapshot of how it looks like):

ticker_startdate	ticker_enddate	announcedate	companyid	companyname	gvkey	objectroletype	keydevid	headline
1999-01-22		2021-03-03	32307	NVIDIA Corporation	117768	Target	706285581	NVIDIA Corporation Presents at Dask Distributed Summit 2021, May-19-2021
1999-01-22		2021-03-03	32307	NVIDIA Corporation	117768	Participant	706281135	SIGCSE, SIGCSE21, Mar 13, 2021 through Mar 20, 2021
1999-01-22		2021-03-03	32307	NVIDIA Corporation	117768	Participant	706282057	Helmholtz, Helmholtz GPU Hackathon 2021, Mar 15, 2021 through Mar 24, 2021
1999-01-22		2021-03-03	32307	NVIDIA Corporation	117768	Participant	706282098	Association For Advancing Automation, Automate 2021, Mar 22, 2021 through Mar 2
1999-01-22		2021-03-03	32307	NVIDIA Corporation	117768	Participant	706322613	MIT Technology Review, EmTech Digital 2021, Mar 23, 2021 through Mar 25, 2021
1999-01-22		2021-05-18	32307	NVIDIA Corporation	117768	Participant	715223687	Cesium GS, Inc., Epic Games, Inc., SIGGRAPH 2021, Aug 09, 2021 through Aug 13,
1999-01-22		2021-05-18	32307	NVIDIA Corporation	117768	Participant	715328119	Hot Chips, Hot Chips, Aug 22, 2021 through Aug 24, 2021
1999-01-22		2021-05-18	32307	NVIDIA Corporation	117768	Sponsor	715328119	Hot Chips, Hot Chips, Aug 22, 2021 through Aug 24, 2021
1999-01-22		2023-05-29	32307	NVIDIA Corporation	117768	Target	1839070220	NVIDIA Collaborates with SoftBank Corp. to Power SoftBank's Next-Gen Data Center
1999-01-22		2023-05-29	32307	NVIDIA Corporation	117768	Target	1839067683	NVIDIA Announces NVIDIA Avatar Cloud Engine for Games
1999-01-22		2022-10-18	32307	NVIDIA Corporation	117768	Target	1805282448	Oracle and NVIDIA Partner to Speed AI Adoption for Enterprises
1999-01-22		2024-01-24	32307	NVIDIA Corporation	117768	Target	1869360890	NVIDIA Corporation - Special Call
1999-01-22		2024-01-24	32307	NVIDIA Corporation	117768	Target	1869360890	NVIDIA Corporation - Special Call
1999-01-22		2024-01-24	32307	NVIDIA Corporation	117768	Target	1869347568	NVIDIA Corporation - Special Call
1999-01-22		2016-01-27	32307	NVIDIA Corporation	117768	Target	323587886	NVIDIA Corporation, Q4 2016 Earnings Call, Feb 17, 2016
1999-01-22		2017-10-10	32307	NVIDIA Corporation	117768	Target	626001638	NVIDIA Announces World's First AI Computer to Make Robotaxis A Reality
1999-01-22		2019-01-28	32307	NVIDIA Corporation	117768	Target	600077334	NVIDIA Corporation, Q4 2019 Earnings Call, Feb 14, 2019
1999-01-22		2022-05-15	32307	NVIDIA Corporation	117768	Target	1783353053	NVIDIA Corporation - Special Call
1999-01-22		2022-10-27	32307	NVIDIA Corporation	117768	Target	1806198443	NVIDIA Corporation - Special Call
1999-01-22		2023-07-26	32307	NVIDIA Corporation	117768	Target	1849120510	NVIDIA Corporation - Special Call
1999-01-22		2023-07-26	32307	NVIDIA Corporation	117768	Target	1849139028	ServiceNow, NVIDIA and Accenture Team to Accelerate Generative AI Adoption for Enterprise
1999-01-22		2023-12-05	32307	NVIDIA Corporation	117768	Target	1863664867	Yotta Data Services Collaborates with NVIDIA to Catalyze India's AI Transformation
1999-01-22		2024-02-17	32307	NVIDIA Corporation	117768	Target	1872021320	NVIDIA Corporation - Special Call
1999-01-22		2011-08-25	32307	NVIDIA Corporation	117768	Target	140691810	Update to NVIDIA Corporation's Equity Buyback Plan
1999-01-22		2011-08-25	32307	NVIDIA Corporation	117768	Target	140691810	Update to NVIDIA Corporation's Equity Buyback Plan
1999-01-22		2011-11-22	32307	NVIDIA Corporation	117768	Target	144563804	Update to NVIDIA Corporation's Equity Buyback Plan
1999-01-22		2010-09-04	32307	NVIDIA Corporation	117768	Target	112731126	NVIDIA Corporation Presents at Citigroup 17th Annual Global Technology Conference
1999-01-22		2010-12-23	32307	NVIDIA Corporation	117768	Participant	117488910	JPMorgan Chase & Co., JPMorgan Tech Forum at CES, Jan 06, 2011
1999-01-22		2011-01-03	32307	NVIDIA Corporation	117768	Participant	117804024	The Goldman Sachs Group, Inc., Goldman Sachs Technology & Internet Conference

Then do the following:

- (1) Use Agentics AI to explain the reason behind the analyst recommendations (why buy, strong buy sell or strong sell).
- (2) Ignore analyst recommendations. Then use Agentics AI as alternative to make buy/sell recommendations and compare them with (i) analyst recommendations available in the data set, or (ii) actual realization of prices, i.e., whether the recommendation is successful (i.e., the stock price went up and the recommendation was a buy/strong buy). Do you beat analyst recommendations most of the times?
- (3) Account for analyst recommendations. Use Agentics AI to make buy/sell recommendations for stocks. In the recommendation produced by your agentic AI system, you can take into account available analyst recommendations from the IBSE data set, and confirm, upgrade, or downgrade

them. What percentage of times do you make a successful recommendation, and how does this compare with the benchmark analyst recommendations in the IBES data set?

- (4) Using the Agentic AI system recommendation, construct an optimal portfolio (e.g. solving the mean-variance Markowitz problem) using only the stocks for which you recommend a buy. Then evaluate the out-of-sample Sharpe ratio of this portfolio over time.

Project 2: Estimating Default Probability or Credit Risk:

Credit Default Spreads (CDS) are a measure of credit risk perceived by the market. Credit Default Swap contracts (see, for example, <https://www.princeton.edu/~markus/teaching/Eco467/10Lecture/CDS%20Presentation%20with%20References.pdf> for an overview of how CDS contracts are currently priced) are agreements between a protection seller and a protection buyer, where the protection buyer wants to insure himself against the default of a company for a period of X years. If X=1, this is a 1-year CDS contract with spread S_1 . If X=2, this is 2-year CDS contract with spread S_2 .

A rough approximation (which you can take for granted) yields that the default probability is equal to the credit spread divided by the loss given default. Here the probability of defaulting in one year is S_1/LGD .

ticker	date	docclause	primarycurve	runningcoupon	primarycoupon	parspread	upfront	cdsrealrecovery
APLINC	2007-01-09	CR14	N		N	0.01053760994873050		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.01053760994873050		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.01053760994873050		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.01053760994873050		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.0111997850036621		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.0111997850036621		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.0111997850036621		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.0111997850036621		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.002748397491836550		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.002748397491836550		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.002748397491836550		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.002748397491836550		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.01152265502929690		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.01152265502929690		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.01152265502929690		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.01152265502929690		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.0036674049697876		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.0036674049697876		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.0036674049697876		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.0036674049697876		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.00488965		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.00488965		0.3725000008940700
APLINC	2007-01-09	MR14	N		N	0.00488965		0.3725000008940700
APLINC	2007-01-09	XR14	Y		N	0.00488965		0.3725000008940700
APLINC	2007-01-09	CR14	N		N	0.00932186251831055		0.3725000008940700

While CDS spreads are available for most of the biggest companies in the United States, they are not available for smaller companies. For instance, we do not have quoted CDS spreads for small-medium enterprise (SMEs). For example, we do not have a CDS spread quoted for the Burbank airport.

The objective is to use agentic AI to construct default probability estimates for these SMEs. One possibility is to use AI agents to find companies which operate in the same sector as the SMEs, plus news and information which can be related to these SMEs, and construct these default probabilities. In addition to providing these estimated default probabilities, you should report the decision making process behind the provided estimated default probability.

Project 3: AI and Blockchain: Use Agentics to generate smart contracts from contracts written in natural language. Here are some suggested steps:

- Compile a list of templates of contracts written in natural language. Examples of these contracts include property taxes, rental agreement, etc...
- Then use Agentics to convert it into a smart contract. Make sure it is compliant with the general smart contract guidelines, and deployed on the Ethereum Testnet.
- If not, then engage into a formal verification and validation with Agentics to improve the contract till it is deployable.
- Then, test the contract by invoking a few functions of the smart contract from a user perspective.

Hence, this project consists of two stages: (1) smart contract code generation, (2) agentic invocation of smart contracts.

Project 4: Market analysis based on LLM. See Dr. Gliozzo's code https://github.com/IBM/Agentics/blob/main/tutorials/amap_reduce.ipynb for a sample.

The user would specify in natural language what type of indicators he is looking for to capture the health status of a company (focusing on anomalies) over the past 90 days. For example, the company's performance too low relative to other companies in the same sector, stock volatility reaching an all-time high, change in the board organization, merge with other companies, etc...

Based on the natural language text, Agentics would generate a markdown with the required user's input.

Using all data from WRDS (including stocks, balance sheet reports, reports, news, and market indicator) and macroeconomic data available from the Federal Reserve website, Agentics would generate a report summarizing what requested by the user.

Project 5: Construct a portal of MPC servers for finance. This project consists in first collecting a list of financial services (APIs, news, risk indicators, employment, GDP, etc...). Second, create restful APIs for each of the identified service. Then convert them into MCP servers. Then write a generic agent code, which can talk on behalf of the person and provide a tool.

