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Practical Use of AI in Drafting and Prosecution of Chemical Patent Applications

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Overview

- Introduction and general tips for using AI
- AI recognition of chemical structures
- AI uses for patent prosecutors
- Practical use of AI in patent drafting
- Practical use of AI in responding to office actions: focus on responding to obviousness rejections

General Thoughts on the Near Future of LLMs

- In the evolution of computers, the major exponential advance was when computers because available to everyone
- Since the advent of home computers, progress has been mostly linear, with the biggest advances coming in how we as humans use and interact with computers, and how computers are connected to one another.
    - Important advances included storage technology, GUIs, and the internet. These developments were all slow and not sudden. For the most part these advances allowed more people to take advantage of computers, and increased the amount of information and entertainment easily available on computers, rather than fundamentally advancing what computers could do.
- The evolution of LLMs will likely be similar. The major exponential advance has likely already occurred. Now we need to learn how to use LLMs more effectively. This will occur on the user side as well as the software development side.
- Software developers need to figure out how to make LLMs more useful, such as by:
    - Enabling LLMs to easily talk to other software, making the user interface better, giving the user more control over what the LLM is doing and increasing transparency of analysis, giving the user the flexibility to use more compute time per prompt as needed, and reducing the cost of compute time.

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Introduction to AI and General Tips for Using AI

What is AI?

- “Artificial intelligence”
- Technology that enables computers to simulate human intelligence and problem-solving capabilities
- A large language model (LLM) enables computers to achieve language generation and other natural language processing tasks
- LLM AIs predict what a person would do, based on the materials used to train it and the “prompt” given to the AI

What Types of AI Can Lawyers Use?

- If you plan to upload confidential information into the AI or ask about confidential information, the AI must keep confidential information private and secure
    - Note that the majority of general AI tools do not do this
- If you are not uploading confidential information or drafting prompts that contain confidential information, okay to use any AI
- Remember that AIs that do not keep your information private and secure can use your prompts and/or uploaded information for training and can reproduce this information for another user

AI Cautions

- AI output can include errors or hallucinations
  - False facts
  - False citations
  - Incorrect reasoning
- AI output must be carefully reviewed/revised before incorporating into any work product

Why can AI be Valuable to Attorneys?

- Not simply for increasing efficiency, because there are many things AI cannot do, and AI output still needs to be carefully reviewed
- By increasing efficiency of mundane, simple, and time-consuming aspects of a process, more time can be spent focusing on more complex aspects, and on fine-tuning and perfecting work product
- AI should be viewed as an augmentation, not a replacement

How Does AI Generate an Output?

- The AI refers to your “prompt”, any documents you have uploaded into the “session”, as well as often to a hidden “system prompt”
  - TIP: Rename uploaded documents using the AI software so the names are easy to type and unambiguous.
  - TIP: Make sure you tell the AI which documents to consider when you give it the prompt
- The AI also refers to past prompts and past AI output that is part of the session.
  - TIP: Start a new session if you do not want the past prompts or AI output to affect the next output you request.

Prompts

- **What is a prompt? (“User prompt”)**
  - The input given to an AI by the user to guide it in generating a specific output.
- **What is a system prompt?**
  - A hidden, predefined set of instructions given to an AI to establish its foundational behavior, personality, and context in its user interactions. Unlike a user prompt, a system prompt provides a consistent, overarching directive that guides the AI’s responses, constraints, and overall tone across all conversations.
- **How to draft a good prompt?**
  - Generally, pretend you are giving an assignment to a 1st year associate that has infinite time but almost zero experience
  - Usually the chance of a satisfactory output is higher if you provide as much detail as possible
  - To decrease risk of getting a low quality output, avoid prompts that require multiple steps of analysis that depend on each other

Bad Prompts v. Good Prompts

- **Bad**
  - Short
  - Imprecise/ambiguous
  - Multiple steps of analysis that depend on one another

- **Good**
  - Full of precise information
  - Break down analysis into individual steps

Bad Prompts v. Good Prompts

- **Multistep analysis**
  - Even a single step of analysis entails a risk that the AI will not select the best answer
  - A single bad decision in a multistep analysis can corrupt the final output as an “error carried forward”; multiple bad decisions can make this worse
  - Try to design your AI interactions/prompts so that you inject yourself into the reasoning process at each step. Ask the AI to provide ranked lists of options, and you can select the best one for moving forward, or if none are satisfactory you can have the AI repeat the last step of analysis with different parameters.

Bad Prompts v. Good Prompts

- **Mediocre prompt: “Analyze the office action and propose a response strategy to the rejection of claim 1 over reference D1 in view of D2.”**
  - You have no idea how the AI will select a feature for amending the claims. The AI cannot tell which features are more or less valuable to the client.
  - You have no idea whether the AI will also consider directly arguing against the combination of D1 + D2 without amending the claims.
  - If the AI does consider arguing against the obviousness rejection, you don’t know how the AI will accomplish this.
  - A better approach will tell the AI exactly what you want. Tell the AI you want to look at amendment strategies, and also to look at directly arguing the obviousness rejection. Then, select the strategies that make the most sense for the client, and work with the AI to refine these.

Bad Prompts v. Good Prompts

- **Better prompt:** “Analyze the rejection of claim 1 over reference D1 in view of D2. Determine whether there are any features disclosed in the present application or dependent claims that are not described in D1 or D2 that could provide a suitable way forward to amend claim 1 and overcome the rejection. As you conduct your analysis, place particular emphasis on features described in the working examples of the present application and/or that are emphasized as advantageous in the application. In your analysis, do not consider features described only in the background section of the application. In your analysis, also consider whether D1 teaches away from XXX from D2 which the Examiner alleges would have been combined with D1 to accomplish the invention of claim 1, whether it is possible to argue that there would have been no motivation to combine D2’s XXX with D1, and whether claim 1 recites features that could be argued as having properties not predictable from the combination of D1 and D2. In your output, organize the strategies from most likely to succeed to least likely to succeed. Please conduct the analysis very carefully.”
- [Work with AI to select/refine strategies]

Bad Prompts v. Good Prompts

- **Mediocre prompt:** “Analyze the invention disclosure and draft a set of claims toward the invention.”
- **Better:** series of prompts
  - “Analyze the invention disclosure and suggest a list of possible independent claims that cover all of the embodiments of the invention described in the invention disclosure.”
  - [work with the AI to select and refine the preferred independent claim(s)]
  - “Draft a set of dependent claims that both broadly and narrowly describe each feature of all of the embodiments of the invention described in the invention disclosure, placing particular emphasis on features that the examples illustrate as providing advantageous properties.”
  - [work with the AI to refine the dependent claims]

AI General Tips: Takeaways

- Use the AI software to give uploaded documents simple and unambiguous names
- Start a new session to avoid contaminating next output with past prompts/outputs
- Make sure the documents you want the AI to analyze are selected, and the documents you do not want the AI to analyze are de-selected
- Draft long, precise, detailed prompts that avoid requesting multi-step analysis
- Inject yourself into the analysis whenever possible
- Always carefully review/revise AI output before using

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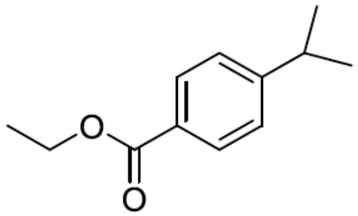
AI Recognition of Chemical Structures

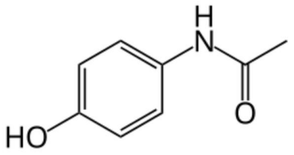
AI Recognition of Chemical Structures

- Most AIs, including most AIs designed for legal use, cannot reliably recognize and analyze complex chemical structure images
- Only some AIs can recognize embedded Chemdraw images in Word document
  - Not clear if they do this by recognizing the Chemdraw format or turning the Word document into a PDF and analyzing the image itself.
- Some AIs can recognize complex chemical structures, but they are specialized and not trained/intended for legal work
  - Examples: ChemVLM, ChemMLLM
- Note that this is an area of technology that is changing quickly
  - For Example, as I was preparing this presentation, one of the LLM software products that our Firm subscribes to added an update to allow direct uploading of *.sdf chemical structure files (structural data file).

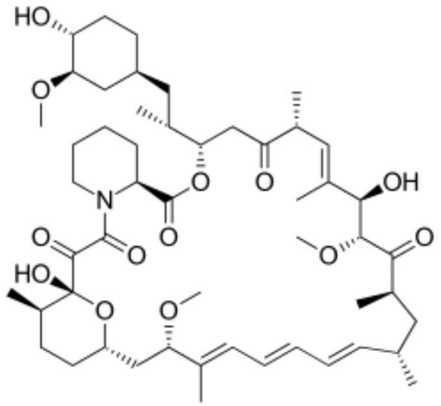
AI Recognition of Chemical Structures

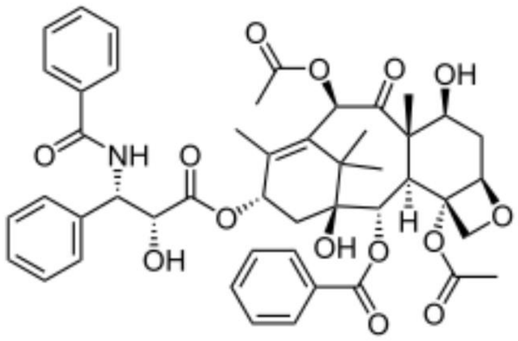
- Example of “simple” chemical structures:





- Example of “complex” chemical structures:



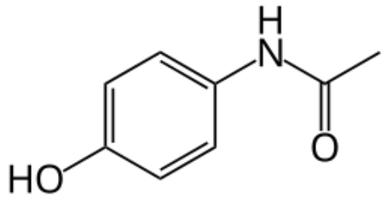


AI Recognition of Chemical Structures

- Most AIs can recognize and analyze chemical structures that can be written out as textual (“line entry”) representations
  - e.g., R^1-X-R^2 wherein R^1 is alkyl, X is a para-substituted benzene ring, and R^2 is alkoxy.
- Most AIs can understand IUPAC nomenclature
- Most AIs can understand conventional line entry versions of chemical structures, such as:
  - SMILES = Simplified Molecular Input Line Entry System
  - InChI = IUPAC International Chemical Identifier
  - SMARTS = SMILES Arbitrary Target Specification
  - SLN = Sybyl Line Notation

SMILES

For example, *N*-(4-hydroxyphenyl)acetamide,



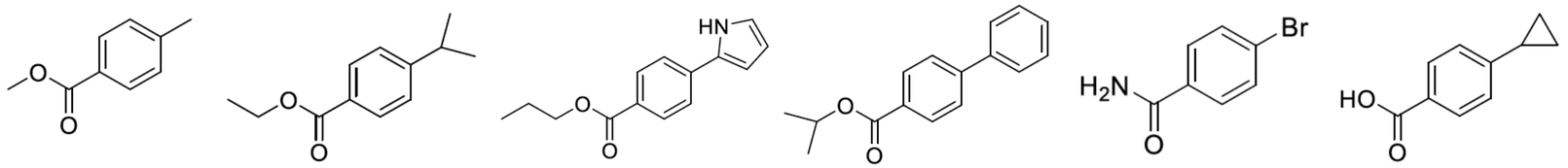
= CC(=O)Nc1ccc(cc1)O

How to Convert Chemical Structure Image to SMILES

- Learn SMILES and manually derive it (not a recommended approach)
- Draw the structure in ChemDraw, select the structure, and select “copy as” and “SMILES”
- Use other software that can directly translate chemical structure images to SMILES, such as:
  - Mathpix
  - Pic2mol
  - DECIMER.ai
  - JChem for Office

AI Recognition of Chemical Structures

- Loaded Word document with embedded Chemdraw structures, told the AI to analyze the document for images:



- The AI was able to successfully generate IUPAC names for the compounds.
- Prompt: Draft an independent claim that broadly encompasses compounds 1-6 using a textual general chemical formula.
- Output:

Claim 1. A compound having the formula:

R1-Ph-CO-R2

wherein:

Ph represents a phenylene group;

R1 is selected from the group consisting of:

C1-C6 alkyl,
C3-C8 cycloalkyl,
phenyl,
4-10 membered heterocyclyl containing 1-3 heteroatoms selected from N, O, and S,
halogen, and
hydrogen;

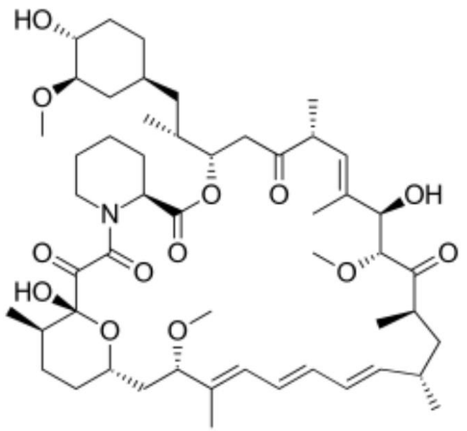
R2 is selected from the group consisting of:

-OR3 where R3 is C1-C6 alkyl,
-NR4R5 where R4 and R5 are independently selected from hydrogen and C1-C6 alkyl, and
-OH;

or a pharmaceutically acceptable salt thereof.

AI Recognition of Chemical Structures

- Loaded Word document with embedded Chemdraw structure, analyzed images:



- Prompt: Generate the IPUAC name for the structure in the uploaded document.
- Output:

Based on the complex macrocyclic compound shown in the document, I cannot provide a complete IUPAC name due to:

Multiple unresolved stereocenters requiring precise stereochemical assignments
Complex macrocyclic ring system with unclear numbering priorities
Image resolution limitations preventing definitive structural determination

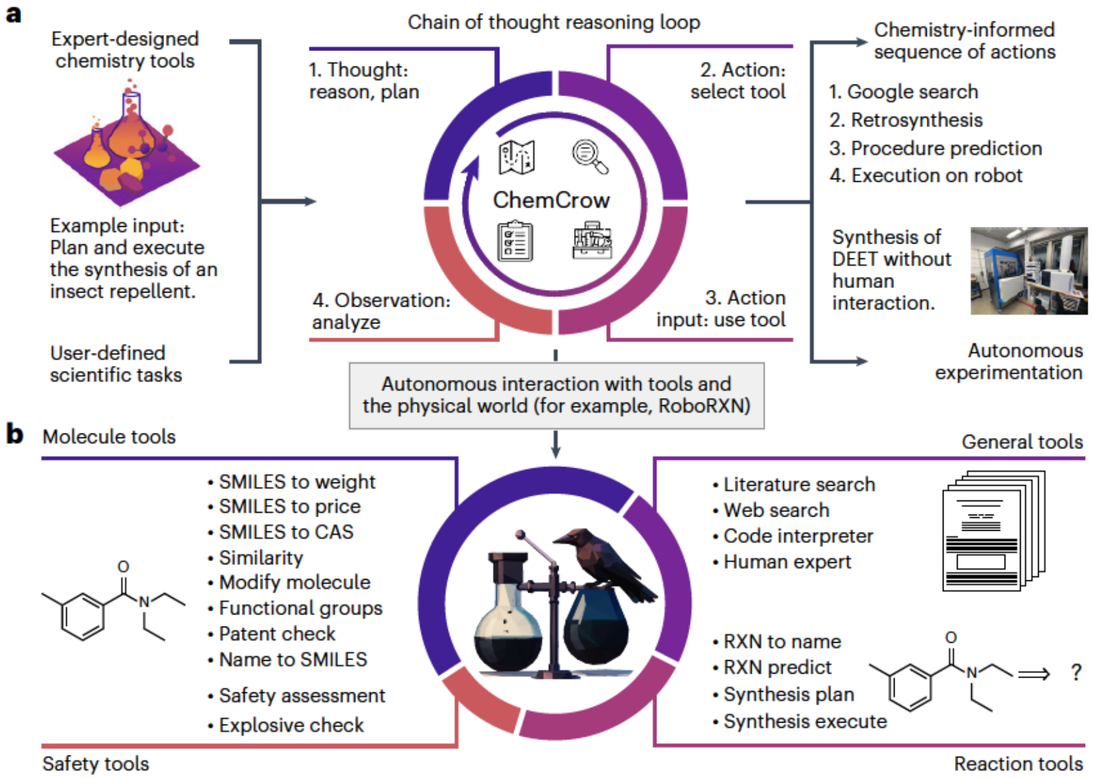
Recommendation: For patent claim analysis, obtain the compound's established name, CAS number, or have the structure professionally verified rather than relying on IUPAC nomenclature generation from this diagram.

Future of AI Recognition of Chemical Structures

- AIs require specialized training and/or access to tools to recognize chemical structure images. Most legal AIs are not equipped for this.
- Specialized software tools (several of which are also LLMs) exist for recognition of chemical structure images.
- Ability to “talk” to other software can drastically enhance AI utility
  - AI agents, API (Application Programming Interface)
- With an AI designed for legal use, accessing APIs to talk to other software could be problematic for safeguarding privacy/confidentiality of information
- Legal AIs should/will either incorporate chemical structure image recognition, or incorporate ability to access private local software utilities via APIs that can translate images to line entry representations

Ability to “Talk” to Other Software Drastically Enhances AI Utility

- Must read: M. Bran, A., Cox, S., Schilter, O. *et al.* Augmenting large language models with chemistry tools. *Nat Mach Intell* **6**, 525–535 (2024). https://doi.org/10.1038/s42256-024-00832-8



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Practical Uses of AI for Patent Prosecutors

Practical Uses of AI for Patent Prosecutors

- Assistance with patent drafting
- Assistance with patent prosecution
- Assistance with drafting disclosures(s) from transcript of inventor meeting
- Assistance with emails
- Assistance with evaluating search results/prior art
- Assistance with reviewing
- Assistance with searching
- NOTE: Always review output carefully!

Practical Uses of AI for Patent Prosecutors

- Reduce risk of unhelpful output by using AI for what it is best at: simple but time-consuming tasks.
- Have a conversation with AI about one or more documents to save time and orient yourself quickly.
  - Invention disclosure (e.g., rapidly learn about the invention)
  - Prior art document(s) (e.g., what is disclosed?)
  - Present application (e.g., do I have support for a particular amendment?)
  - Office Action / Prosecution History
    - For example, how was a certain claim/feature rejected?
  - Law (e.g., M.P.E.P.)
  - Client documentation

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AI Assistance for Patent Drafting

Summarizing Disclosure/Examples

- **Mediocre prompt:** “Draft a summary of the invention disclosure.”
- **Better prompt:** “Analyze the invention disclosure carefully and draft a thorough summary of all embodiments and features of the disclosed invention. Make sure that the summary is complete and does not omit any features described or implied by the disclosure. In the summary, include a separate detailed description of the working examples and explain which features of the invention the examples demonstrate result in advantageous properties over conventional approaches.”

Drafting Background Section

- **Mediocre prompt:** “Draft a background section for the patent application.”
- **Better prompt:** “Analyze the disclosure and draft a brief background section for the patent application that is 1-3 paragraphs long. Do not describe any aspects of the invention in the background section. Do not specifically describe any of the uploaded prior art documents in the background section.”

Summarizing Possible Advantages of the Invention

- **Mediocre prompt:** “What are possible advantages of the invention?”
- **Better prompt:** “Analyze the disclosure and generate a thorough list of possible advantages of the various embodiments of the invention. Make sure the list is complete and do not omit any potential advantages described by or implied by the disclosure. Organize the list by the type of advantage.”

Assistance with Claim Drafting

- **Mediocre prompt:** “Draft a claim set toward the invention.”
- **Better prompt:** “Propose independent claims that cover all the embodiments described or implied by the invention disclosure. Do not limit the proposal to a single independent claim; draft as many independent claims as is needed to encompass all disclosed or implied embodiments. As you draft the claims, please consider reference D1 and D2 and make sure that the proposed claims are novel over these references while still encompassing the embodiments of the present disclosure as broadly as possible. After each proposed independent claim, draft an analysis explaining why the proposed claim covers the disclosed invention and why the proposed claim is novel over D1 and D2.”

Reviewing the Application

- **Mediocre prompt:** “Review the application and suggest any needed changes.”
- **Better prompt:** “Review the application in conjunction with the invention disclosure and determine, for the application, whether each of the following criteria are satisfied: 1) all of the embodiments described or implied by the invention disclosure are thoroughly claimed with no features omitted, 2) all of the claim features are described in detail in the specification, 3) the collection or measurement method for all of the numerical data or characteristics in the application is explicitly disclosed, 4) all of the claim features have proper antecedent basis, 5) no typos, grammatical errors, or formatting inconsistencies occur. Draft a report describing any changes needed to the application in order to attain each of criteria 1-5 above.”

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AI Assistance for Responding to Office Actions

Practical Use of AI for Responding to Office Actions

- Load office action, present application, and cited references into AI software
- TIP: When you load documents, rename them using the AI software to give them short specific names and refer to the documents specifically when you draft your prompts.
- Useful for searching application for support
- Useful for initial review of a specific rejection
- Useful for reviewing present application to determine if any features are not described or suggested by the cited references
- Not so good at determining, on its own, which features might be most valuable to a client

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AI Assistance for Responding to Office Actions: Focus on Obviousness Rejections

How to Overcome an Obviousness Rejection

- No prima facie case
  - The cited references fail to describe/suggest all claimed features
  - No reason/motivation to combine references as alleged by the Examiner
  - Teaching away
- Secondary evidence of nonobviousness
  - Claimed invention has properties that could not have reasonably predicted from the cited references

All Claimed Features are Not Described/Suggested by the Cited References

- **Mediocre prompt:** “Do the references cited by the office action in the rejection of claim 1 describe all the features of claim 1?”

- **Better prompt:** “The Office Action rejects claim 1 as obvious over D1 in view of D2. Please analyze the Office Action’s description of the alleged disclosure of each feature of claim 1 and perform the following analysis: confirm that the Office Action has analyzed each feature of claim 1, confirm that the portion of D1 or D2 cited by the Office Action for disclosure of each feature actually describes what the Office Action alleges, and for each claim feature determine whether there are any available arguments that D1 or D2 does not actually describe or suggest the claim feature that the Office Action alleges that it does. Organize your analysis of the claim features in the output in the same order as the features occur in claim 1. Be very thorough in your analysis and do not omit any available arguments. At the end of your output, highlight the claim features and associated arguments that would be most likely to succeed in a response to the office action.”

No Motivation to Combine References

- **Mediocre prompt:** “Can you draft an argument that there is no motivation to combine the cited references used to reject claim 1?”
- **Better prompt:** “The Office Action rejects claim 1 as obvious over D1 in view of D2, alleging that a person of ordinary skill in the art would have combined feature XX from D2 with D1’s YY to accomplish the invention of claim 1, stating that the motivation for such combination is ZZZ. Can you draft an argument that a person of ordinary skill in the art would have had no reason or motivation to combine feature XX from D2 with D1’s YY? Please make the arguments complete and thorough, and incorporate into the arguments an explicit and complete rebuttal of the Office Action’s alleged motivation of ZZZ.”

Teaching Away

- **Mediocre prompt:** “Is there a teaching away argument available against the cited references?”
- **Better prompt:** “The Office Action rejects claim 1 as obvious over D1 in view of D2, alleging that a person of ordinary skill in the art would have combined the XXX from D2 with the YYY from D1. Please determine all possible available arguments that D1 teaches away from incorporating D2’s YYY into D1’s XXX. Organize the arguments by most likely to succeed to least likely to succeed. Please conduct the analysis very carefully and do not omit any possible arguments from the output.”

Unpredictable Properties

- **Mediocre prompt:** “Draft an argument explaining that there would have been no way to predict the properties of the claimed invention from the cited references.”
- **Better prompt:** “The Office Action rejects claim 1 over D1 in view of D2. Draft an argument explaining that the property recited in claim 1 of XXX could not have reasonably been predicted from the combination of D1 and D2.”
- **Better prompt:** “The Office Action rejects claim 1 over D1 in view of D2, alleging that the claimed property of XXX would be obvious because XXX is described as a result-effective variable of feature YYY by D2 and therefore a person of ordinary skill in the art would have varied YYY to optimize XXX to the claimed values. Draft an argument that D2 fails to describe or suggest that the claimed property of XXX is correlated to feature YYY, rebutting the Office Action’s allegations that XXX is a result-effective variable of feature YYY.”

Questions?

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Thank you

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