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Project Summary

SmartCaster automatically generates football summaries. It falls into the realm of information technologies. This approach retrieves the finalized data of football games provided by the NFL API, constructing headlines and brief content. This project requires knowledge of natural language processing, as well as machine learning, to better derive tone and rhetoric from other sports news authors. A dictionary and thesaurus must be provided for the sake of readability. The composition, in the eyes of the reader, must be nearly indistinguishable from the work of a sports columnist. A grammar must also be developed to ensure generated sentences follow the rules of English linguistics. The program takes articles, headlines, and updates as input, reading the frequency of words used in certain contexts, and make judgments on its own word choice based on these detectable nuances.

This Small Business Innovation Research Phase I project gives insight into how humans understand language. The process of coding a program to construct short multi-sentence updates, mimicking the styles of typically published sorts updates and articles, coupled with the programmer's own interpretation of the English language, can be likened to teaching. The difference arises when the "teacher" must set aside subjective teaching practices and conform to a logical process that forces the programmer to evaluate their own understanding of English. It becomes difficult when diversified word choice for the sake of eliminating redundancy arises, but the program should produce content that is informative while refraining from repetitiveness for the sake of emphasis. Words cannot be overused, but when implementing the thesaurus, the program must also be aware the synonymy does not equate interchangeability. If "bad" or poorly written content is mistakenly fed through the program as input, the "habits" and biases, groomed through processing "good" articles, should rectify any undesired deviations. Interpreting data is also an extremely complicated task, especially in the field of sports where a multitude of variables must be accounted for when trying to evaluate any given player and predicting their future performance. *SmartCaster* will bring a greater cognizance in the understanding of language, as well as providing insight into the motivations behind how authors choose to compose their work. Aside from being a practical reporting tool, the program will essentially be a reflection of the human thought process.

Rather than having analysts construct headlines and updates after football games, *SmartCaster* produces outputs of similar quality. Post-game summaries will provide accurate data, free of the biased commentary of sports columnists, while retaining a sentiment and an option of pandering to a specific audience within a particular team's culture. Ultimately, the goal is to guide an understanding of language from the bottom-up, where words are known by rigid definitions and sentences are composed according to the established grammatical framework. The program will become a technical tool in tracing how sentences relate to one another as subjects are placed in greater context. As a method of exploring and cataloging the complexity of language and rhetoric, this program has the potential to map the evolution of an individual's understanding in a "lead by example" format, with human-composed articles formatting its parameters.

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Elevator Pitch

The Customer. Describe the expected customer for the innovation. What customer needs or market pain points are you addressing?

SmartCaster serves the average-to-avid sports fan along with fantasy football players. Relaying information from live games to users is difficult without actually viewing the game. Audio-only commentators (such as radio announcers) bog down statistics and play details with semi-relevant references and input and hard statistical summaries are not often used, or even viewed, in the same manner. *SmartCaster* constructs brief summaries free of extraneous content, lined with some tone set to pander to the user's preferences.

The Value. What are the benefits to the customer of your proposed innovation? What is the key differentiator of your company or technology?

SmartCaster allows users to receive news on the players and teams they care about. In the same sentiment, the content presented is built around their preferences. Sports columnists inject their biases into their rhetoric, and commentators over-inform viewers with constant narration and sidetracking. Through natural language generation, tone can accompany small content. The wordiness of commentary can be eliminated to emphasize the importance of stats and core information, and readability can complement plain statistical fact. In this comfortable medium, the update provides a single clear thought that is comprehensible, concise, and informative.

The Innovation. Succinctly describe your innovation. This section can contain proprietary information that could not be discussed in the Project Summary. What aspects are original, unusual, novel, disruptive, or transformative compared to the current state of the art?

Automated storytelling is the future of reporting, especially when it comes to small, informative content. The time and effort put into constructing mere headlines and summaries is less imperative when expressing fact trumps creativity. Diversity in sentence structure and simple word usage is easily trained when the length of the content is constrained. The moment a football game concludes, straight data can be delivered in the form of a brief multi-sentence update.

Rather than piling on utilities into an all-in-one tool, or confusing users with extensive features, *SmartCaster* stands alone as a reporting tool. The delivered content consists of a single thought easily understood by the user. It is non-intrusive in its accessibility, and hopes to give as little distraction as possible. Rather than overstimulating the user with massive amounts of content, *SmartCaster* provides a fast and easy way of staying informed without distracting from the theatrics of the game and its media.

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Commercial Opportunity

SmartCaster possesses two characteristics rare to the sports industry: simplicity and clarity. Sports entertainment draws in fans by stirring fanaticism, drawing support from theatrics and injecting emotion into events to personalize teams. Sports reporting is primarily a self-promotional tool, surrounding primary content with contextual references and prodding the viewer into submerging themselves into the cultural mindset. Fantasy sports act in tandem with traditional sports entertainment, dependent on it for the data but more interactive and thought-oriented. As part of the entertainment industry, sporting events are meant to stimulate users and participants, provoking attachments and connection to distant faces and icons for a nominal fee.

SmartCaster, like other sports reporting outlets, looks to feed the user with the information they feel necessary to keep up with their teams. Participating in fandom is not a necessity, but a phenomenon that embraces inclusiveness for the sake of consumerism. Sports fans do not support their teams out of convenience, but rather out of passions inspired by socially imbued intrigue. Going to games, researching team facts, and buying official merchandize is not seen as a burden as much as it is a hobby. Being active in this section of culture turns the means of participation into another game, at the very least another form of entertainment.

SmartCaster occupies a niche often overlooked by the sports industry. This area is already saturated with outlets delivering information with the intent of captivating its audience. Rather than competing with these other mediums *SmartCaster* looks to work alongside them. As opposed to luring the user in and arousing them to consume more content, *SmartCaster* delivers brief summaries that inform the user without causing distraction. Its composition is centered around a single coherent thought. What is given is clear and concise, leaving little room for questioning or interpretation. It is almost passive in its purpose, non-conflicting with the rest of the user's informational intake, yet somehow necessary in gaining useful information. Preferences can be set to include only the teams and players the user wishes to be informed about, serving all from the lukewarm football fan to the avid fantasy team player.

SmartCaster becomes useful in the realm of fantasy football. As fantasy team owners look to find data on their players outside of whatever application they use for actual gameplay, *SmartCaster* provides them with a quick report easily internalized. Fantasy sports, more specifically fantasy football, are a growing topic in the United States. In 2014, there were 41.5 million participants in fantasy sports in the United States and Canada. In 2015, there were 56.8 million. Of those 56.8 million, 40 million players were involved in fantasy football. In 2016, there is projected to be 75 million fantasy football team owners. On average, each of those participants is expected to spend \$107 within their league, primarily in the form of bets. DraftKings and FanDuel, two fantasy sports websites, took in \$3 billion in entry fees and lost \$400,000 in payouts to winning participants. Aside from being a highly lucrative gambling industry, the entertainment value of playing on a week-to-week basis over an already interactive platform creates a personal emotional investment that nearly trumps the financial side.

Alongside football games, ESPN and NFL feature fantasy football programs. Reporting includes statistics relevant to fantasy football calculations, and ties between player performance and fantasy team owner advice become pertinent. NFL RedZone, which features all Sunday football games simultaneously, includes continually updated fantasy player statistics as games progress. Football media and fantasy football have become intertwined in American culture to the point

where the relationship is, to some degree, mutually beneficial: football fans are drawn to fantasy football through peer pressure and stay for the entertainment value. Fantasy team owners dive into a sea of information and research to better their chances of winning week-to-week. Both ESPN and the NFL offer means of playing fantasy football online, as well as their own means of reporting, but these summaries lie among a sea of features that clutter their websites.

SmartCaster is another extraneous tool in the world of football, and it risks being overlooked. It is designed to be as small as possible, only pushing out stats the user cares for. Hesitancy about using a tool that performs such a minute function is expected, and once implemented it acts fairly passively. It can be framed as pure novelty in its capacity. But, in the same thread, accessibility and convenience becomes a key feature. Large bodies of text can be overwhelming to a reader doing thorough research. Many people merely skim massive analytical articles, if not skip them altogether. *SmartCaster* provides non-intimidating small content that bears easy on the reader's attention span.

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Broader Impact

Automated storytelling is the future of small content. Entity extraction and sentiment readers processing bodies of texts lends understanding to how literary composition should be constructed. In growing the product and development in the field of natural language processing, *SmartCaster* looks to deepen thought around the logic of language structure.

All languages have grammatical rules and syntax that guide the recipient's thought process as they parse through sentences. With the English language, there seem to be many exceptions, or creative liberties, that have the potential to convey variant feelings from the formal structure. From changing intent comes changing structure, and from changing structure comes changing tone. Although it is difficult to pinpoint the subjective emotions that these variances illicit, it is clear that the language itself is the guide for thought. In embodying the intent, *SmartCaster* can help pioneer the way into how human minds actually process language, from conceiving ideas to producing concrete structures communicable and navigatable by other humans.

The implications of automated storytelling, however, threatens to render small content authors obsolete. As long as grammatical rules are obeyed, and sentence diversity prevails through multiple iterations, the efforts put forth by this venture can bring forth a new wave of reporting where all brief summaries can be reported instantly through automated means as soon as input is available. This industrial dimension can be applied to mass reporting and information dissemination in a clear, concise form. The informative medium that requires little attention is high in demand in the age of micro-blogging and single-utility applications.

The potential for misuse and mass misinformation is high. The real issue arises from training sentiments against specific content to generate biases. Along the same thread as Microsoft's Twitter AI, "Tay", and even IBM's "Watson", machine learning programs utilizing natural language generation can mirror the rhetoric and agenda of the propagator and its audience. Mindless reaffirmation could embed these biases into the AI and pander to communities under the guise of entertainment. With the issue of "fake news" reporting on the rise, and the revelation of how the mass audience is susceptible to these lies, automated storytelling with the purpose of pushing forth special agendas is dangerous. As with all culture and its media, communities need to be held accountable for the transgressions of its own creation. The overseer of AI can do as they please to reflect and validate their own beliefs, but it falls upon the community to be knowledgeable enough to discern passive propagation from human-composed content. Education and staying informative becomes the responsibility of the individual if they truly refuse to be duped by these easily published lies.

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 Technical Discussion and R&D Plan

Describe the key technical challenges and risks in bringing the innovation to market. Which of these will be your focus in the proposed Phase I project?

The primary technical challenge in bringing *SmartCaster* to market is the constant development required to keep it competitive with other automated storytelling machines that are currently being publicly developed and tested. The field is growing out of both intrigue and convenience. Much of the development will probably include styling, such as rhetoric and diversified syntax depending on the audience, and adaptation to meet the standard composition of various professional fields. Words, buzzwords, and jargon need to be recognized and understood by automated storytelling and publishing programs to make them more appealing to a wider range of audiences.

Describe the innovation in sufficient technical depth for a knowledgeable reviewer to understand why it is innovative and how it can provide benefits in the target applications. Supplement this description with any necessary background information.

An issue with the current method of live reporting is the author's liberty to make their own conclusions, often formed from their own understanding and biases. Sometimes, this can't be helped as information needs to be pushed into public view, and written in a captivating manner to draw in more readers. Slight misinformation and fanaticism begin rolling as the implications of the author's rhetoric easily snowball in front of an audience thoroughly unfamiliar with the subject. Programs like *SmartCaster* have the ability to put forth headlines free of biases, especially when the only input is the hard data.

As for more lengthy texts, professionals that write guides also can't help but use their jargon when conveying their knowledge. Sometimes, words can't be substituted in the mind of someone who uses it often enough in their line of work, especially when it is understood by their peers and reinforced by repetition. *SmartCaster*, and other automated storytelling mediums, can translate these sub-cultural nuances and bring academic works to a wider audience with more common rhetoric.

Describe the key objectives to be accomplished during the Phase I research, including the questions that must be answered to determine the technical and commercial feasibility of the proposed concept.

The key objectives to be accomplished during Phase I research are linguistic in nature. The "best" way to write content is subjective, but readability, especially in English composition, generally comes from diversity. Repetitiveness is disheartening, so dictionaries must be defined to provide a "switching-out" of synonyms, as well as adding emphasis to aspects that typically demand them, such as notable moments and otherwise surprising facts. Sentence diversity is also a large issue, especially in human authorship. The perceived gracefulness of variance throughout composition lends it interest, as opposed to the monotonous styling of "template" writing.

The marketability of automated storytelling devices does not hail from how interested the reader is in the content it produces, but how much of it they can bear reading before mentally withdrawing. When it is known that a passionless machine produces text meant to illicit personal

responses, it loses some degree of its personal aspect. However, if the content is composed in such a way that conveys information while maintaining aesthetic rhetoric, the reader's attention won't stray until their curiosity in the subject has been satisfied.

The widespread commercialization of such a product comes from its adaptability to fit the needs of various audiences. News reports, sports columnists, technology analysts, among many others, all have different methods of conveying their thoughts. Their means of understanding vary in their fields, as well as their personal view, and direct themselves into a discipline that has set its guidelines in what the acceptable means of delivery are, from language to professional jargon to sentiments. The defining aspect of how well an automated storytelling device can fend among others is not merely by its performance, but before how many audiences it can pander to.

Describe the critical technical milestones that must be met to get the product or service to market.

The technical milestones are all algorithmic, mostly consisting of the most optimal way to handle the inputted information and the data structures required to compose and publish said information. When it comes to personalization of the product, the parameters must either be stored on the device or created through a corpus of example texts. The former would require an already defined knowledge and the ability to check against the words, potentially requiring a large mass of storage space. The latter would be time-consuming, and although storage-friendly would cost ad-hoc allocated processing time and resources.

Research and Development Plan

1. Build a dictionary and define sentence structures.
 - Parts-of-speech for words must be known.
 - Synonymy and antonymic relationships between words must be defined.
 - Various sentence structures need to be explicitly defined along grammatical rule.
 - Parse trees will be used to ensure proper grammatical syntax.
2. Allow for input of hard data for sentence construction.
 - Data will likely find its place according to recognized trends in placement.
 - Bits of data will accompany certain nodes, or words.
3. Generate strings of sentences that relate to one another.
 - The introduction of data can help guide the primary subject of content.
4. Create sentence diversity in content composition.
 - Linguistically, the flow of composition comes with variation.
5. Determine most relevant content through analysis.
 - When given mass amounts of information, the program must prioritize materials.
 - The program must highlight "important" matter and convey it as "important".
6. Expand dictionary to appeal to wider audiences.
 - The marketability of the product comes with how adaptable it is.

