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SMART AGRICULTURE BEYOND INDUSTRY: ANALYZING THE FUTURE OF AGRICULTURE THROUGH SOCIAL MEDIA INSIGHTS

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Abstract

Smart agriculture involves the use of technology such as drones, GPS, robotics, IoT, AI, big data, and solar energy to improve farming practices. As with any disruptive innovation, however, stakeholder expectations can be misaligned from what the innovation can actually deliver. There can also be varying perspectives on what the innovation actually entails, related topics of interest, and impediments to large scale adoption. This study examines public perception of smart agriculture and its perceived drivers and challenges as present in social media discourse. We collected online posts from Twitter, Reddit, forums, online news and blogs between January 2010 and December 2018 for analysis. Results show that 38% of social media posts contained emotion with 52% joy, 21% anger and 12% sadness. Through topic analysis, we discovered seven key drivers and challenges for smart agriculture which included: enabling technologies, data ownership and privacy, accountability and trust, energy and infrastructure, investment, job security, and climate change.

Background

Agriculture is the main source of food for the global populace, as such, the industry continues to drive towards better and more efficient ways of food production (Food and Agriculture Organization, 2003; King, 2017).

There is a paradigm shift towards extending the notion of precision farming with data-intensive computer technologies and artificial intelligence to deliver a new Smart Agriculture (Gacar et al, 2017)

With 2.46B users in 2017 representing 71% of all internet users and 33% of global population (Statista, 2018), Social Media (SM) has become an avenue for researchers to gather unsolicited insights into topics.

Literature Review

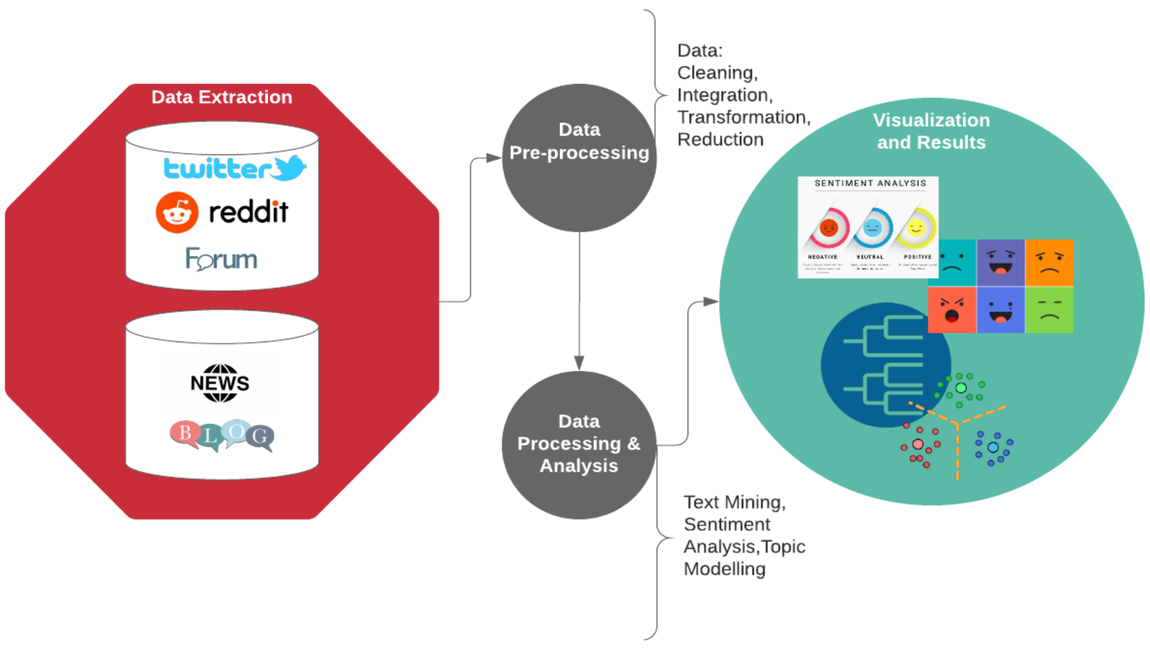
SM platforms has uses beyond personal purposes. They have been used marketing, advertising, and promotions (Hanna et al., 2011), as a source of news (Kwak et al., 2010), and even as a platform for intellectual and academic discourse (George, 2011; Jackson et al., 2001).
Unsolicited insights can be gathered from SM to gain a much deeper understanding of how issues affect people.

- Bian et al., (2016) and Runge et al., (2013) used it to analyze public perception on IoT and nanotechnology respectively.
- Greaves et al., (2013) used SM to detect quality of healthcare.
- Franch (2013) successfully predicted election result with SM.

In agriculture, SM analytics has been used in two notable works, it was used by:

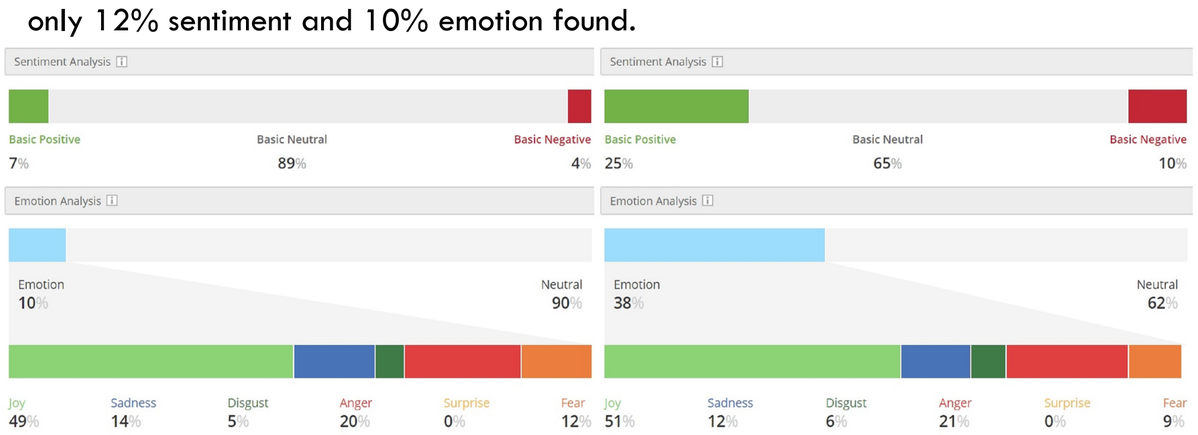
- Choi (2016) to measure impact of severe weather in Argentina
- Connolly et al., (2016) identified barriers facing farmers.

Methodology



Results

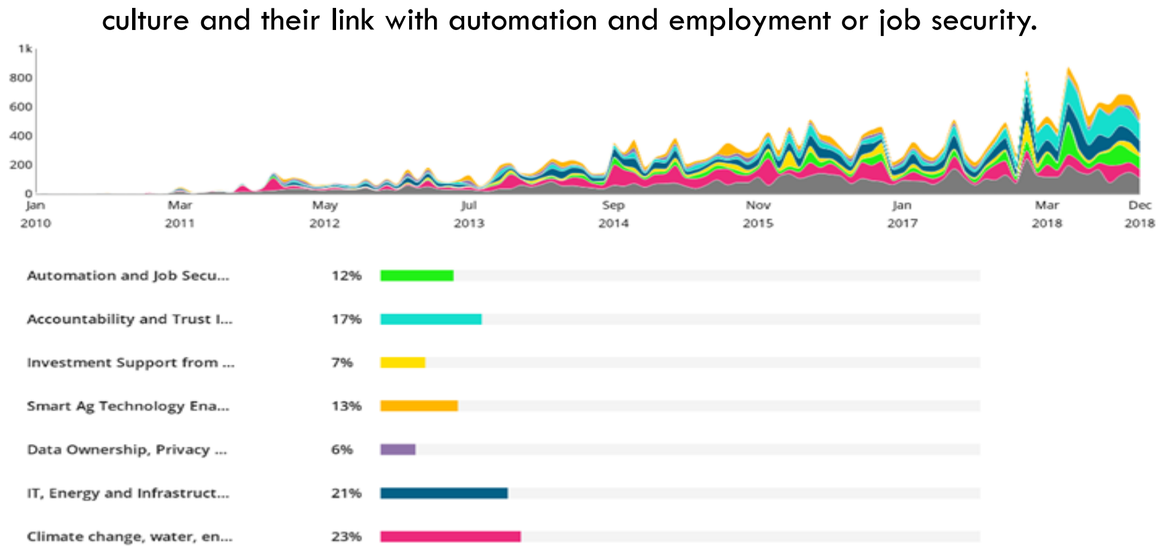
Posts influenced by news and blogs lacked much sentiment or emotion with the only 12% sentiment and 10% emotion found.



Personal opinions from twitter, forums, reddit and comments had 35% sentiments: 25% positive posts and 10% negative posts. Emotional analysis was also 38%: 52% joy, 21% anger and 12% sadness.

Joy	Anger	Sadness
Such a positive and important day for agriculture, digital adoption and transformation opportunities are huge #DigitalFarm	#smartfarmingisnot setting an irrigation well to shut off on the wrong day. At least I realized it didn't shut off before it ran an extra 24 hours.	"The real threat of #AI is not killer #robots, it is job displacement...drivers, precision agriculture, etc." @AndrewYNg @FortuneMagazine
I <3 precision agriculture... :-) #ESRIUC has a great video about farming making a difference. absolutely fantastic. Farmers + GIS = win!	annoying subject= precision agriculture	Buried deep inside d policy of "climate-smart agriculture" are concepts like "sustainable intensification" (through, e.g., GMOs); "ecosystem services" (quantification, commercialization, privatization of ecosystems); "costs & benefits" analysis in contexts where d poor never win!
14-hour day hosting scientists from 35 countries who are working on feeding the world+on climate-smart agriculture. Tired + inspired!	Iman Boot, DG AGRI "Why are smart farming/digitisation & use of big data in agri not yet delivering? #DynamicAgri	#smartfarming is great, but right now there's no incentive for farmers spend their cost savings on things other than increasing their herd size/stocking density as encouraged to do so by #FoodHarvest #FoodWise @Finegael policies, so emissions still rising.. :-(

Our text mining model identified and categorized 74% relevant posts with 26% categorized as irrelevant/off-topic. Most posts linked smart agriculture with food security and sustainability with climate change, water and the environment. Other topics included the underlining technologies driving smart agriculture and their link with automation and employment or job security.



Discussion

SM users are happy with the notion of Smart Agriculture; 71% of sentimental posts are positive and 52% of emotional posts express joy. This result however is not evidence of farmer readiness to adopt smart technology.
SM users agreed with researchers on the following key factors for driving the smart agenda:

- Innovativeness of smart agriculture is in its use of drones, sensors, global positioning systems (GPS), robotics, IoT, vertical farms, artificial intelligence (AI), data management tools, and solar energy to improve farming practices (Cho, 2018; Yahya, 2018).
- Smart farming is the way forward, but better data protection frameworks and governance structures are needed (European Commission, 2013; Roopaei et al., 2017).
- Smart Agriculture could be undermined by issues concerning trust and accountability (Walter et al., 2017).
- The use of IoT and Cyber-physical systems on farms for such tasks as irrigation and fertilizer application can result in a cost-effective and efficient use of energy (Roopaei et al., 2017).
- There is little belief in the idea of smart technologies taking over workplace jobs rather replacing manual and laborious tasks with digital and autonomous software, will create employment especially for the younger generation (Brougham & Haar, 2018).
- Climate-smart agriculture will result in proper management of scarce environmental resources (Lipper et al., 2014).

Conclusions

This study examined social media for user perception on Smart Agriculture as well as the drivers behind this innovative advancement into food production and sustainable development.

Sentiments gathered from public discourse supported the drive for a smarter and much precise agriculture. And whilst there are issues with adoption due to technological barriers in rural and developing economies, data ownership, privacy and security, these seem to be trivial as investment in the sector continues to rise and global stakeholders like the UN and EU continue to address privacy concerns.

Our findings prove that while gathering unsolicited views from social media can be cumbersome, it is a rich source for uncovering insights regarding matters of public interest and can further guide research and development into supporting technologies, drive governance and promote of strategies for large scale deployment.