Questions from the trail: A statistical analysis of hiker data

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What technology preferences to hikers have? Do their preferences correlate with age, data needs, or other preferences? This position paper explores hiker responses to a series of questions, many of which are technology related. Hikers were asked a series of questions to capture things that they find important about hikes and technology. Responses revealed clusters of users based on their answers, and ongoing analysis will reveal correlations among the answers.

PROBLEM

Is going to an outdoor hike still a reason to escape the daily tension in our life caused by technology? Or has technology invaded the outdoors now too? Recently I came across this blog posting by a thru-hiker from the 1990's [1]:

> "I thru-hiked back in 1999, and cell phones were not as omnipresent in society back then, and nobody had one on the trail for sure. One guy did have this thing he would type his journals into, then hook it to a telephone mouthpiece to send it home, but that's it. Nobody had digital cameras back then either. I'm wondering what it's like on the trail now. I would be really upset if I saw people talking on cell phones or texting while on the trail, but I guess that people are doing it. What's the scene like? Is there a backlash against texters, if there are any?"

It was a thought-provoking question, and the replies to this post were equally thoughtful. One person replied, "Yes, technologies are used by hikers, and they don't care as long as others are not disturbed." This chat session made me wonder if there's any difference in perspectives of different hikers, and whether there are differences between long distance hikers and short distance hikers, or people of different ages, or other factors.

Considering my lack of experience as a hiker, the content I am presenting here is based on my interaction with the hikers I have come across as part of the Technology on the Trail initiative [5]. For my study am going to consider only digital technologies like smartphone, smartwatch, GPS systems, DSLR cameras, etc. We build on previous research from a cultural probe conducted by Sarah Grace Fields [2]. The cultural probe seeks to encourage participants to think deeply about their experiences during outdoors activities. A cultural probe is a design technique in which human perspectives are understood in their real-world context by encouraging people perform thoughtful tasks in their natural environment through artifacts like maps, camera or diary [3]. Other research conducted by Zann Anderson, Candice Lusk, and Michael Jones identified multiple groups and their smart technology usage patterns [4].

APPROACH

My approach sought to collect data from 40 self-described hikers at two venues—the Technology on the Trail 2017 Workshop and Virginia Tech's 2017 ICAT Day—then understand how their responses were related. We had the following steps for each to our approach:

1. We asked 7 age and hike preference questions and 5 "Would You Rather" questions (see Appendix A).
2. We performed k-mode clustering analysis on the first set of questions to see what key clusters would emerge.
3. We crafted pairwise overlay plots, parallel graphs, and bar graphs for the second set of questions to see potential relationships between question responses.

EARLY FINDINGS

Our data analysis is still ongoing, but this section highlights a few key findings.

1. An MCA factor map [7] from k-modes clustering [6] (for k=3 and k=6) reveals clusters of similar hikers. We are encouraged by the tightness of the clusters and are further analyzing the results, toward defining personas for each cluster. Personas differ in motivations and technology; e.g., one younger person carries lots of smart technology on short hikes, while a middle-aged person hikes with select technology toward furthering science.
2. Age seems to correlate with social media approaches, hiking expenses, and technology use. Younger people prefer tweeting, while older prefer blogging. Younger people spend more money and bring more technology on their hikes than older people.
3. People who want to collect lots of data on hikes also prefer to bring lots of technology, while those who don't care about data don't bring technology.

This early analysis is shown in Figures 1-5 at the end of this paper. Ongoing work seeks to explore statistically significant differences related to our research questions.

FUTURE WORK

Using smart technology while on a trail is common these days. Though people say that they go on a hike to stay away from the hectic work life, and to spend time with the family, and similar reasons, I think smart technology is blended more than people indicate. Out of 40 participants, irrespective of which cluster they fall into, mostly chose a smartphone as a primary gadget to navigate on the trail. Instead of thinking should we carry a smartphone while on while or not if we remember to use it when its necessary and needed we can try to use it smartly.

I am considering this research with this study, whose results can serve as a guide that can be used to purchase equipment, or build hiking products or apps. Clustering the data reveals similarities between hiker characteristics, but there is more analysis to be done. I will identify appropriate statistical methods to understand significance. To understand the correlation between each data point statistically; I will use Hamming distance function [8]. This future analysis will provide the roadmap necessary to understand differing needs of people on the trail.

REFERENCES

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[8] Norouzi, Mohammad, David J. Fleet, and Ruslan R. Salakhutdinov. "Hamming distance metric learning." *Advances in neural information processing systems*. 2012.

Figures

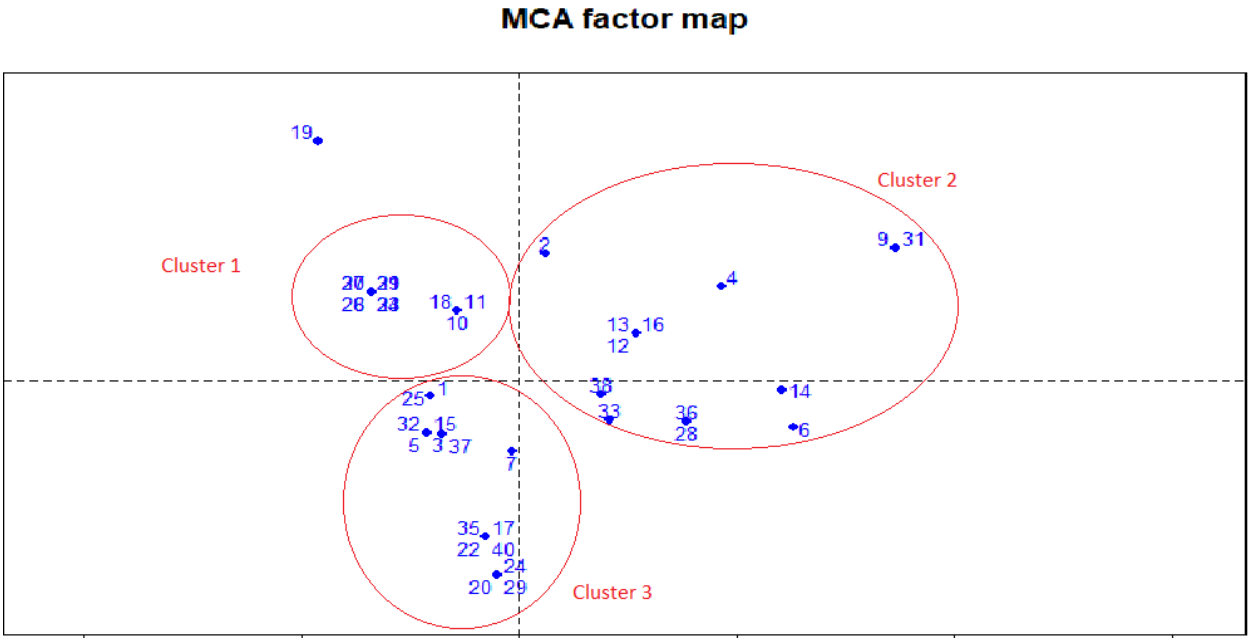


Figure 1: k=3 cluster of participants based on hiking preference questions.

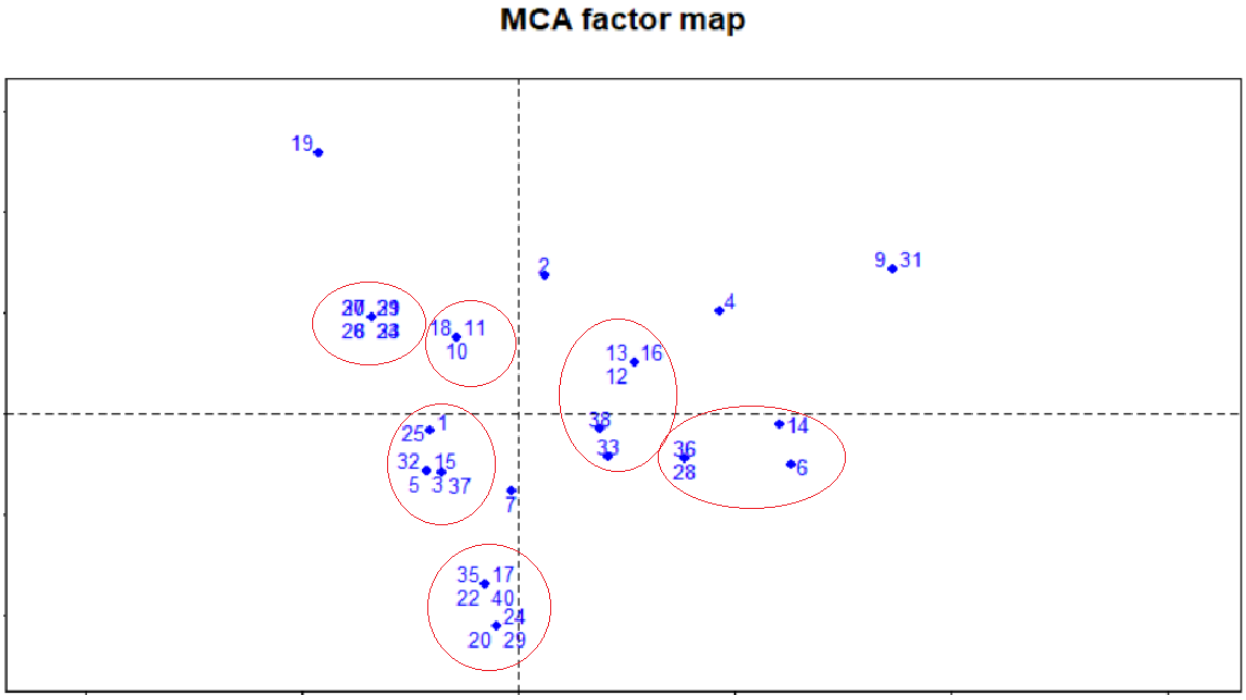


Figure 2: k=6 cluster of participants based on hiking preference questions.

Figure 3: Age vs. Expenses: Overlay plot (from JMP). I used this plot to see the fluctuation between age and expense. As we can see in the graph some participants ages from 18 to 30 tend to spend more money on the gadgets for a hike than the people who are above 31 to 50 age group. An interesting observation is that 17 of the people with age around 51 to 70 tend to spend less money.

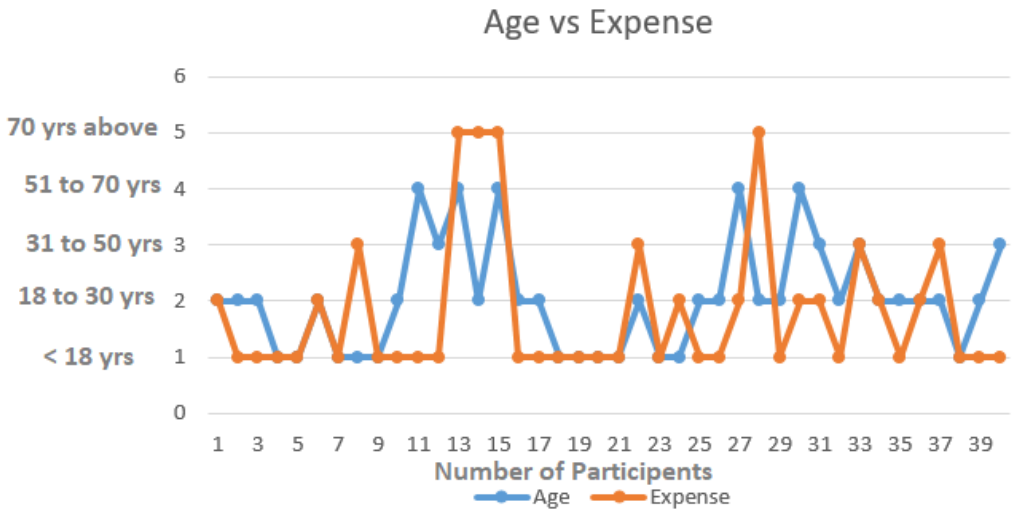


Figure 4: Age vs. gadgets: This parallel graph (created using JMP) shows density of links between any two points as number of people who have selected both of those options. In the graph people who choose to carry 1, 2 and 3 gadgets are in the age group of <18 and 18 to 30 yrs. This shows that people in these age groups carry **more devices** while on a hike than the people who are older than 30. These are also the age groups where we spend more money on hiking.

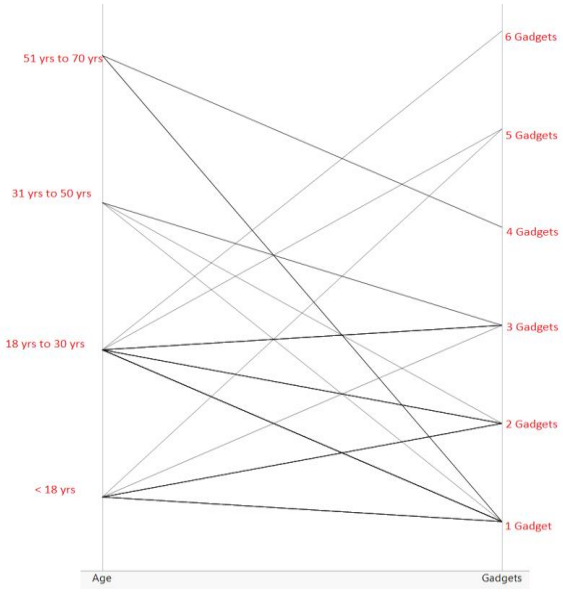
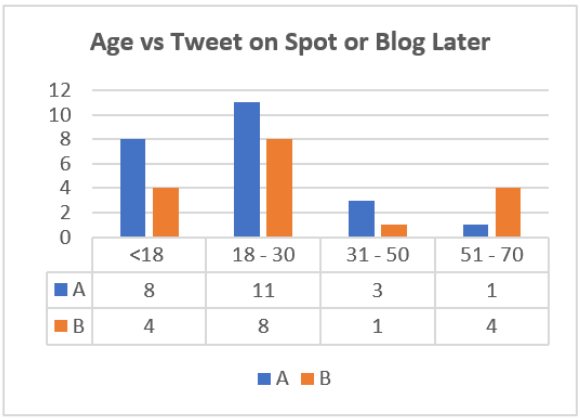


Figure 5: Comparing whether age of the hikers affects mobile usage patterns for social networking while on a hike.



In this graph, we can see people who are less than 30 yrs. are more interested in Tweeting while on a hike instead go back and write a blog about it. An interesting note is that people who are above 51 are not much interested in carrying a smartphone and tweet the real time on the spot.

APPENDIX A: Questionnaire

1. Age:
   A. <18
   B. 18 to 30
   C. 31 to 50
   D. 51 to 70
   E. 71 and Above
2. What is a hike to you?
   A. Walking in marked trails in urban areas
   B. Walking through backwoods, unmarked trails through rural areas
   C. Kayaking / Canoeing
   D. Rock climbing
   E. Jogging outdoors through rural areas
   F. Biking through rural areas
   G. None of the above
3. Which of these define your hiking habits?
   A. I like to go on hikes that take 2 to 3 days
   B. I like to do thru-hiking that takes 3 to 6 months
   C. I like to go on short hikes that take 4-5 hours
   D. None of the above
4. How frequently you hike?
   A. Weekly
   B. Monthly
   C. Once in 6 months
   D. Yearly
5. What is the motivation for you to hike?
   A. Stay away from daily routine and explore nature
   B. Collect data about plants
   C. A part of your fitness regime
   D. Spend time with people (family, friends or strangers)
   E. None of the above
6. What is the maximum amount of money you have spent for a hike?
   A. < 50
   B. 50 to 100
   C. 100 to 500
   D. 500 to 1000
   E. 1000 and above
7. Which of the following gadgets would you prefer to carry for a hike?
   A. DSLR camera, GoPro (or any camera not part of a smartphone)
   B. Smartwatch, Fitbit, etc. for fitness
   C. Smartphone for just calls and navigation apps like Guthook
   D. Smartphone apps for fitness like Google Fit
   E. GPS devise like Garmin eTrex, etc. (separate from smartphone)
   F. No separate camera, just a smartphone camera
   G. None of the above, only paper map
8. Would you rather.
   A. Buy a DSLR so that a picture you take a hike goes viral?
   B. Buy a smartwatch for fitness and look fit in a stranger's picture in a hike that goes viral?

9. Would You rather.
    A. Hike in 35 F but sunny weather and use solar energy for charging devices?
    B. Hike in 55 F but rainy weather and carry heavy batteries for charging devices?
10. Would you rather.
    A. Make use of multiple gadgets like DSLR to take pictures or GPS device to locate poisonous plants and contribute to data actively?
    B. Just use a smartphone and collect data passively through an app while you hike?
11. Would you rather.
    A. Tweet about an interesting spot in real time during your hike?
    B. Write a detailed story in a hiking group on Facebook after finishing the hike?
12. Would you rather.
    A. Use an offline map offered by a water-resistant smartphone app but has charging issues?
    B. Prefer to carry a paper map that is more prone to damage?