GNN and LLM Insights: Multimodal Cues and Gender Disparities in Video Conversations

Appendix

Extended Related Work in Entrepreneurship

Vocal Characteristics: Exploring the association between voice characteristics and funding in the entrepreneurship literature, one prior study focused on the voice valence (voice positivity/negativity) and voice arousal (voice intensity) of entrepreneurs (Allison et al. 2022). Specifically, they examined these two characteristics by conducting a randomized experiment and an observational study using pitches from Kickstarter. Their results showed that voice arousal is significantly related to perceived passion and in turn significantly related to funding.

In the broader context of vocal characteristics research, studies have shown that the pitch of one's voice has a significant impact on their perceived competence, authority, and trustworthiness (Feinberg et al. 2006; Puts et al. 2007, 2016). Moreover, research has shown that gender plays a crucial role in how people evaluate speakers based on their vocal characteristics. For instance, studies that examined how the voice pitch affects perceptions of leadership ability, it was found that leaders with lower-pitched voices were more likely to be chosen as leaders (Tigue et al. 2012; Klofstad, Anderson, and Peters 2012; Klofstad 2016; Mayew, Venkatachalam et al. 2013). This might suggest that because women, on average, have higher-pitched voices than men, voice pitch could be a factor that contributes to fewer women holding leadership roles than men. Furthermore, research has demonstrated that assertive behaviour is perceived negatively when exhibited by females, while it is seen positively when exhibited by males (Eagly and Karau 2002). As such, women may be penalized for exhibiting vocal characteristics that are typically associated with assertiveness and confidence, such as using a lower pitch (Puts, Gaulin, and Verdolini 2006). Conversely, men may be rewarded for exhibiting such vocal characteristics.

Visual Characteristics: Exploring the association between visual characteristics and funding in the entrepreneurship literature, studies have sought to investigate the effects of discrete facial expressions of entrepreneurs during a pitch. For example, a study that utilized pitch videos from Kickstarter showed the benefit of pitching with a greater level of peak displayed joy, especially during the beginning and ending phases of a pitch (Jiang, Yin, and Liu 2019). Moreover, they showed that the amount of time an entrepreneur spends at the peak level of his displayed joy has an inverted U-shape relationship with funding performance. Similarly, a study that used pitches from Kickstarter showed the same inverted U-shaped relationship between the facial expressions of happiness, anger, and fear with funding, while also reported a negative relationship between sadness and funding (Warnick et al. 2021). Another study that examined the association of entrepreneurs' facial expressions with funding, used photographs from Kiva platform and found that women benefit from facial expressions like anger and disgust, while men benefit from facial expressions like sadness and happiness (i.e. both men and women benefit from facial expressions that run counter to stereotypes of their gender) (Davis et al. 2021). Overall, visual information can influence the content of business propositions in entrepreneurial pitch competitions (Tsay 2021).

In the broader context of visual characteristics research, studies suggest that facial appearance can influence perceptions of competence, likeability, and attractiveness (Todorov et al. 2005; Verhulst, Lodge, and Lavine 2010; Grammer and Thornhill 1994; Stefanidis et al. 2022). Furthermore, these effects can vary based on the gender of the individual and the evaluator. For instance, studies have shown that female entrepreneurs with more masculine physical traits, such as a strong jawline, are perceived as more competent and successful than those with more feminine traits, while men with more feminine traits are often perceived as less competent and successful (Heilman and Saruwatari 1979; Rudman and Glick 2001). Additionally, research has demonstrated that women are more likely to be judged based on their appearance than men (Etcoff et al. 2011). Another line of work has shown that women are expected to be more communal and nurturing, while men are expected to be more agentic and assertive (Eagly and Wood 2011). As such, female entrepreneurs who display visual characteristics that align with communal stereotypes, such as a warm smile, may be more successful in obtaining funding.

Verbal Characteristics: Exploring the association between verbal characteristics and funding in the entrepreneurship literature, studies have sought to investigate the association between positive language, specific forms of speech

and arousal (words intensity) of entrepreneurs with funding. In particular, a study measured the positive language in investment proposals from New York and found that business angels prefer moderate use of positive language (Parhankangas and Ehrlich 2014). Another study examined the influence of literal and figurative language that entrepreneurs use to frame their venture (from an investment forum in England) and found that variations in the type of language have limited effects for securing funding (Clarke, Cornelissen, and Healey 2019). Finally, a study that utilized pitches from Kickstarter showed a positive association between arousal words used in project descriptions and project success (Ren, Raghupathi, and Raghupathi 2021).

In the broader context of verbal characteristics, researchers have found that language use and communication style can significantly influence perceptions of competence, warmth, and persuasiveness (Newman et al. 2008; Fiske, Cuddy, and Glick 2007; Tausczik and Pennebaker 2010). Moreover, research has shown that gender plays a crucial role in how people evaluate speakers based on their verbal characteristics. For instance, a study found that women are often penalized for violating gender norms, such as by using assertive language or interrupting others, while men who do the same are often praised (Ridgeway 2001). Furthermore, language use that is perceived as more assertive may be seen as more suited to men, while language use that is perceived as more emotional or relational may be seen as more suited to women (Eagly and Karau 2002).

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Table 1: Descriptive Statistics (A) - Entrepreneurs' Features

Feature	Obs.	Mean	Std. Dev.	Min	Max
(E) Age	1091	38.458	8.677	18.900	74.887
(E) Gender==Female	1091	0.249	0.433	0.000	1.000
(E) Gender==Male	1091	0.573	0.495	0.000	1.000
(E) Ethnicity==Black	1091	0.091	0.287	0.000	1.000
Industry==Children / Education	1091	0.104	0.305	0.000	1.000
Industry==Fashion / Beauty	1091	0.174	0.379	0.000	1.000
Industry==Fitness / Sports / Outdoors	1091	0.100	0.300	0.000	1.000
Industry==Food and Beverage	1091	0.212	0.409	0.000	1.000
Industry==Health / Wellness / Cleaning	1091	0.055	0.228	0.000	1.000
Industry==Lifestyle / Home	1091	0.168	0.374	0.000	1.000
Industry==Software / Tech	1091	0.090	0.286	0.000	1.000
Industry==Pet Products	1091	0.043	0.203	0.000	1.000
Revenue Model==Production/Transactional model	1091	0.812	0.391	0.000	1.000
Revenue Model==Subscription model	1091	0.050	0.219	0.000	1.000
Revenue Model==Rental or leasing model	1091	0.094	0.293	0.000	1.000
Retail Ecommerce==Retail	1091	0.223	0.416	0.000	1.000
Retail Ecommerce==Online	1091	0.546	0.498	0.000	1.000
Has Patent==YES	1091	0.196	0.397	0.000	1.000
Has Patent==IN-PROGRESS	1091	0.105	0.307	0.000	1.000
Num of Presenters	1091	1.544	0.609	0.000	5.000
Has Debt	1091	0.042	0.201	0.000	1.000
Seasonal	1091	0.049	0.215	0.000	1.000
Num of Sales Last Year (USD)	1091	580231.690	1300546.700	0.000	14200000.000
(DV) Received Offer	1091	0.680	0.467	0.000	1.000
(E) Voice Pitch	1091	180.78	35.132	116.795	286.967
(E) Articulation Rate	1091	4.398	0.235	3.458	5.200
(E) Vocal Neutrality	1091	5.186	8.371	0.000	52.887
(E) Vocal Calmness	1091	52.128	28.727	0.000	100.000
(E) Vocal Happiness	1091	17.924	20.536	0.000	99.270
(E) Vocal Sadness	1091	9.615	15.573	0.000	100.000
(E) Vocal Anger	1091	15.147	20.839	0.000	97.191
(E) Smiling	1091	21.887	17.268	0.000	100.000
(E) Facial Happiness	1091	3.338	5.865	0.000	99.270
(E) Facial Neutrality	1091	3.972	5.043	0.000	56.059
(E) Facial Sadness	1091	1.932	4.139	0.000	63.934
(E) Facial Anger	1091	24.319	17.098	0.000	99.999
(E) Financial Sentiment	1091	0.030	0.038	-0.196	0.203
(E) Generic Sentiment	1091	0.184	0.159	-0.500	0.634
(E) Verbal Happiness	1091	65.307	5.977	37.239	82.968
(E) Verbal Sadness	1091	3.234	1.845	0.928	24.855
(E) Verbal Anger	1091	24.876	4.917	8.341	46.915
(E) Trust	1091	4.431	3.919	0.070	26.583
(E) Conflict	1091	12.277	6.989	1.579	64.216
(E) Social Support	1091	14.379	6.552	3.255	48.162
(E) Similarity	1091	3.545	5.896	0.000	51.423
(E) Respect	1091	7.609	5.430	0.767	41.771
(E) Knowledge	1091	84.165	8.276	23.722	97.791
(E) Power	1091	19.772	14.351	0.098	71.649
(E) Fun	1091	5.418	7.732	0.001	74.718
(E) Identity	1091	6.200	5.729	0.108	51.198
(E) romance	1091	1.150	2.231	0.002	26.516
(E) Lexical Diversity	1091	0.499	0.136	0.000	0.834
(E) Lexical Sophistication	1091	11021.753	749.338	7724.000	14178.313
(E) Uncertainty	1091	3.057	2.261	0.000	15.000

Table 2: Descriptive Statistics (B) - Investors' Features

Feature	Obs.	Mean	Std. Dev.	Min	Max
(I) Voice Pitch	1091	159.551	15.948	121.856	225.423
(I) Articulation Rate	1091	4.215	0.181	3.575	4.807
(I) Vocal Neutrality	1091	4.446	4.654	0.000	30.317
(I) Vocal Calmness	1091	62.961	20.785	0.000	100.000
(I) Vocal Happiness	1091	10.454	9.906	0.000	51.712
(I) Vocal Sadness	1091	9.452	9.488	0.000	97.039
(I) Vocal Anger	1091	12.687	14.285	0.000	93.050
(I) Smiling	1091	16.108	8.005	1.333	49.469
(I) Facial Happiness	1091	4.598	2.117	0.579	20.866
(I) Facial Neutrality	1091	6.304	2.576	0.274	20.233
(I) Facial Sadness	1091	1.896	1.241	0.049	22.351
(I) Facial Anger	1091	18.215	7.747	2.923	52.550
(I) Financial Sentiment	1091	0.002	0.041	-0.163	0.126
(I) Generic Sentiment	1091	0.045	0.175	-0.634	0.467
(I) Verbal Happiness	1091	62.422	6.092	0.000	77.918
(I) Verbal Sadness	1091	3.181	1.559	0.000	14.419
(I) Verbal Anger	1091	26.863	4.858	0.000	45.920
(I) Trust	1091	6.962	3.940	0.099	48.850
(I) Conflict	1091	22.795	9.609	3.176	68.254
(I) Social Support	1091	19.465	6.929	5.815	49.650
(I) Similarity	1091	5.586	5.603	0.000	51.671
(I) Respect	1091	12.005	7.273	1.637	68.009
(I) Knowledge	1091	75.849	8.428	31.622	94.512
(I) Power	1091	19.169	10.693	0.230	61.571
(I) Fun	1091	4.949	5.102	0.003	50.250
(I) Identity	1091	9.849	5.837	0.434	49.470
(I) Romance	1091	2.984	3.856	0.005	50.450
(I) Lexical Diversity	1091	0.391	0.107	0.000	0.679
(I) Lexical Sophistication	1091	11613.017	803.430	0.000	14288.269
(I) Uncertainty	1091	4.929	3.580	0.000	23.000

Table 3: Compare the importance of features between female and male entrepreneurs - Logistic regression using controls and main IVs

Features	Entrepreneurs Characteristics			Investors Characteristics		
	Females	Males	Test Difference	Females	Males	Test Difference
Voice Pitch	-0.004	-0.009	0.370	0.023	-0.004	3.360
Articulation Rate	0.265	-0.986*	2.170	0.797	-0.723	1.490
Vocal Neutrality	-0.011	-0.004	0.090	-0.021	-0.010	0.080
Vocal Calmness	0.004	0.004	0.000	0.007	0.003	0.200
Vocal Happiness	0.003	-0.010	1.630	0.011	-0.006	0.750
Vocal Sadness	-0.010	-0.001	0.540	-0.033*	-0.013	1.030
Vocal Anger	-0.005	-0.001	0.190	0.005	0.003	0.030
Smiling	-0.004	0.012	1.670	0.041	0.011	1.650
Facial Happiness	-0.009	-0.018	0.140	-0.088	-0.037	0.440
Facial Neutrality	0.054	-0.009	2.770	-0.190**	-0.067	2.710
Facial Sadness	-0.011	-0.005	0.040	-0.112	0.014	1.080
Facial Anger	-0.005	0.009	1.480	0.043	0.017	1.060
Financial Sentiment	7.399	8.455**	0.040	27.603***	26.337***	0.040
Generic Sentiment	1.415	0.269	0.690	9.331***	6.701***	2.360
Verbal Happiness	0.040	0.035*	0.020	0.060*	0.085***	0.630
Verbal Sadness	-0.140	-0.103	0.140	-0.532***	-0.342***	1.990
Verbal Anger	-0.031	-0.024	0.030	-0.099*	-0.088***	0.060
Trust	-0.010	0.105***	3.970*	0.090*	0.080**	0.030
Conflict	-0.093**	0.005	7.540**	-0.108***	-0.051***	5.410*
Social Support	0.021	0.068***	1.850	0.059*	0.071***	0.150
Similarity	0.031	-0.004	1.120	0.009	-0.010	0.330
Respect	-0.013	0.042*	2.760	-0.009	0.007	0.390
Knowledge	0.012	-0.055***	6.460*	-0.005	0.010	0.480
Power	0.013	0.003	0.510	-0.012	0.034***	6.700**
Fun	0.032	0.002	1.610	0.027	0.020	0.020
Identity	-0.003	0.047*	2.610	0.037	0.001	1.240
Romance	0.150	0.074	0.470	0.030	0.001	0.250
Lexical Diversity	1.363	-2.238*	5.170*	-3.613*	0.260	3.650
Lexical Sophistication	-0.000	-0.000	0.350	-0.001***	-0.001***	1.140
Uncertainty	0.300***	0.094*	5.070*	0.084	0.164***	1.590

Notes. *** p¡.001, ** p¡.01, * p¡.05

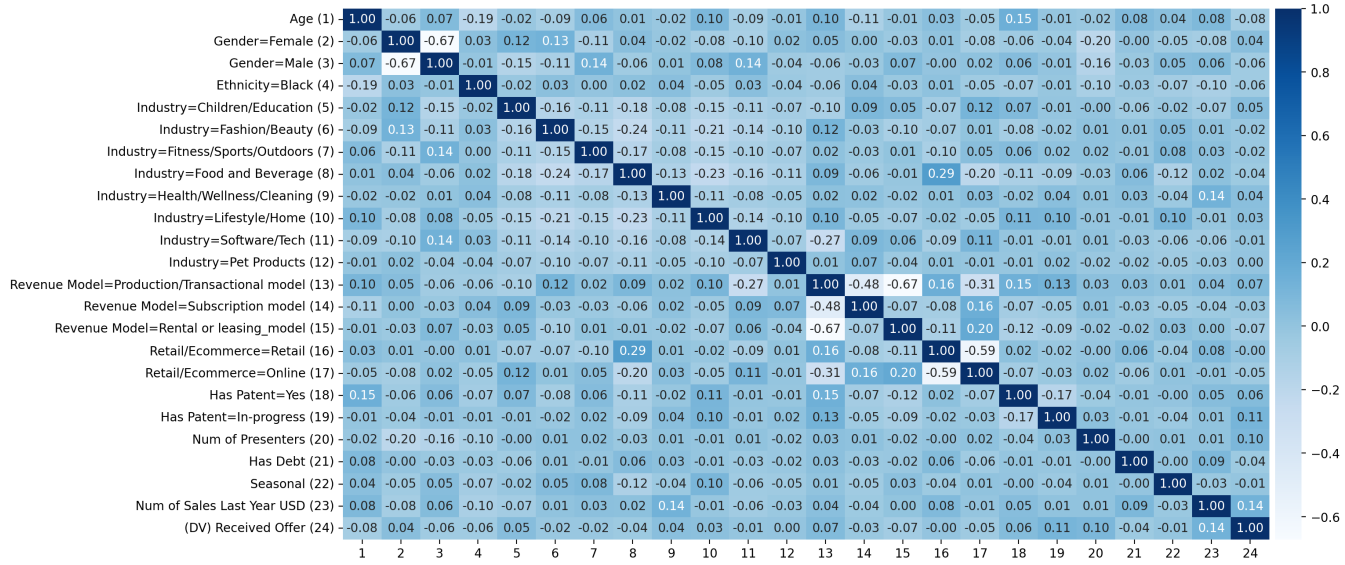

Figure 1: Correlation matrix (A) between the control variables and the predicted outcome (DV)

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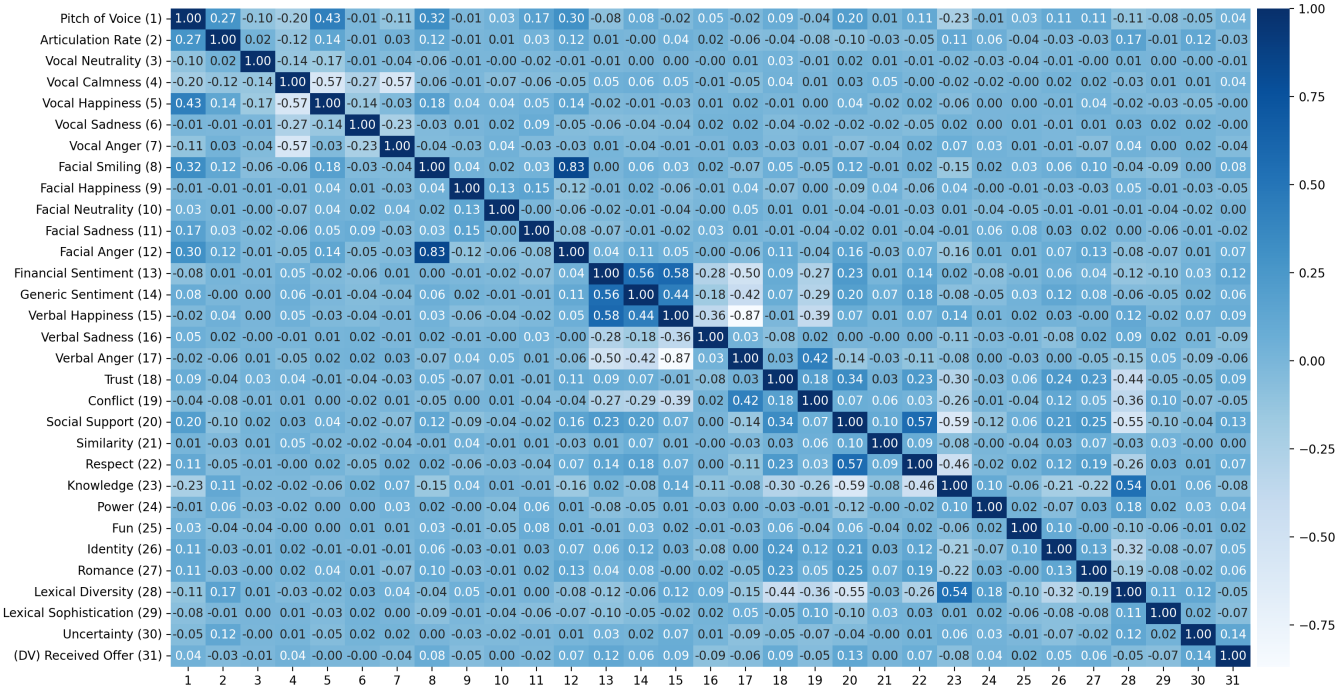

Figure 2: Correlation matrix (B) between the entrepreneurs' features and the predicted outcome (DV)

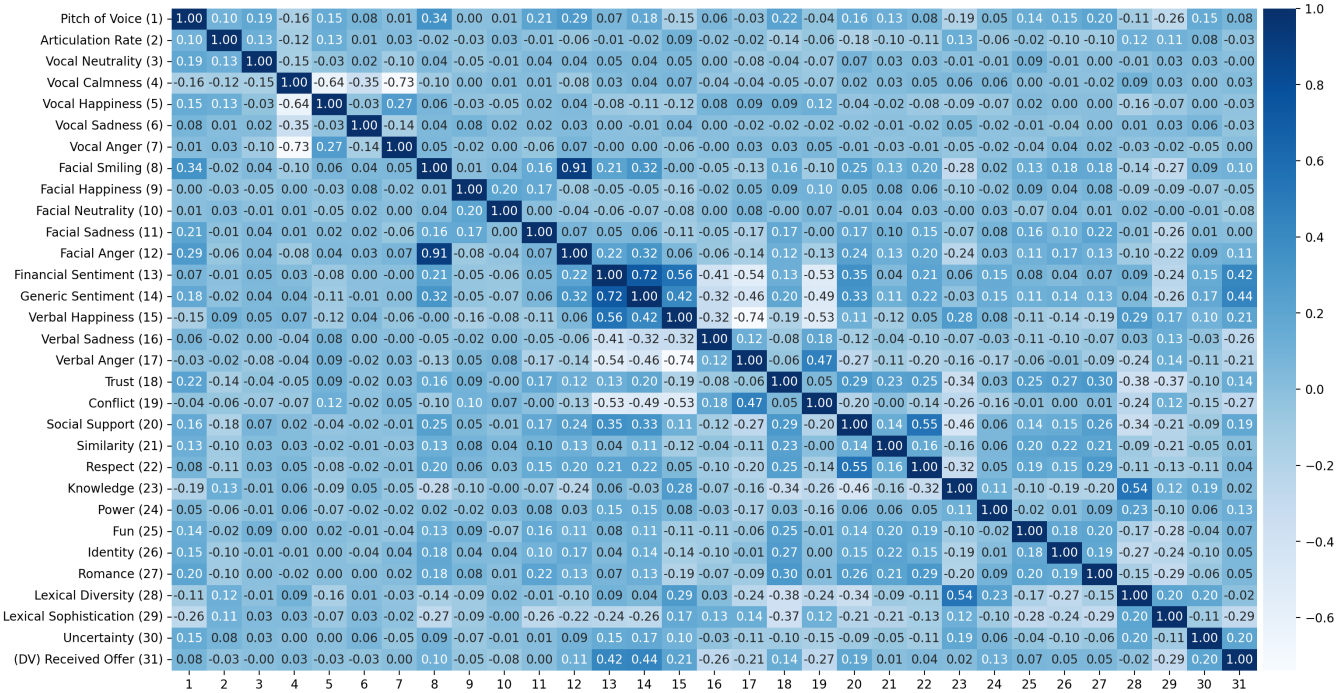

Figure 3: Correlation matrix (C) between the investors' features and the predicted outcome (DV)