






Small Worlds

Measuring the mobility of characters in English-language fiction

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Abstract. The representation of mobility in literary narratives has important implications for the cultural understanding of human movement and migration. In this paper, we introduce novel methods for measuring the physical mobility of literary characters through narrative space and time. We capture mobility through geographically defined space, as well as through generic locations such as homes, driveways, and forests. Using a dataset of over 13,000 books published in English since 1789, we observe significant "small world" effects in fictional narratives. Specifically, we find that fictional characters cover far less distance than their nonfictional counterparts; the pathways covered by fictional characters are highly formulaic and limited from a global perspective; and fiction exhibits a distinctive semantic investment in domestic and private places. Surprisingly, we do not find that characters' ascribed gender has a statistically significant effect on distance traveled, but it does influence the semantics of domesticity.

1. Introduction

What does it mean for a novel's characters to be mobile? And what effects does spatial mobility have on the novel, the story world it imagines, and the novel's greater cultural significance?

Narrative, especially long narratives, almost always involve a change of location or setting. This is an essential component of what narrative theorists identify as the world-building or world-changing function of narration (Bruner 1991; Herman 2009). Whereas setting was once regarded as the unimportant "background" of fictional narrative, it is now broadly recognized as a vital interface with the material and social world (Evans 2025; Evans and Wilkens 2024; Hones 2022; Ryan et al. 2016; Tally Jr 2012). As Friedman 1998 summarized, "Setting works as symbolic geography, signaling or marking the specific cultural locations of a character within the larger society."

For some genres – the travelogue, the quest narrative, the adventure story, even the Bildungsroman – movement through space is an essential component of the genre’s meaning and identity. The inter-relatedness of space and time in narrative – that the movement through space involves a movement through time – has been influentially theorized by Bakhtin 2010 in the concept of the *chronotope*. For Bakhtin, the space-time nexus has a generative function with respect to narrative.

In this paper, we introduce novel methods by which to measure the physical mobility of characters through narrative space and time. We capture mobility in two distinct ways. First, we define mobility as the movement through geographically-defined space and measure the distance that characters travel between countries, cities, regions, and other mappable places. Second, we examine mobility as movement through the non-geographic semantic spaces of rooms, streets, and other “generic” locations.

The geographic plotting of novels has long been theorized as an important component in the construction of narrative meaning (Moretti 1999; Piatti et al. 2009; Ryan et al. 2016; Wilkens 2013). To take one literary example, the characters of Jack Kerouac’s *On the Road* (1957) travel not only because they want to get from point A to point B (at the novel’s start, New York City to Denver), but also because the road represents to them freedom, discovery, adventure, sex, and, for the narrator, Sal Paradise, creative inspiration. When Sal reflects on his younger self, “I was a young writer and I wanted to take off,” he makes use of the double meaning of “take off” – he wants his writing career to blossom, and he wants to be in motion. The two, and all that being on the road represents to Sal, are necessarily connected: “Somewhere along the line I knew there’d be girls, visions, everything; somewhere along the line the pearl would be handed to me” (Kerouac 2002, 8). For the “girls” Sal and his friends meet along the way, travel is a less-viable choice. While many of them also long for new horizons, women are generally represented by Sal and by the novel as a feature of the landscape, rooted in place, and as lacking in intellectual range as they are in geographic reach. Movement through geographically defined space captures the variety of ideological meanings embedded in mobility, as well as the range of cultural restrictions imposed upon it.

In addition to this focus on geographic space, we also measure movement through what we term “generic space.” For many narratives, mobility may be characterized as a movement between generic spatial entities such as rooms, streets, parks, forests, and homes. In Marilyn Haushofer’s feminist novel *The Wall (Die Wand)* from 1963, an invisible wall rises up one day to cut off the unnamed protagonist from the rest of the world. The remainder of the novel involves her moving back and forth between rural hunting lodges and the wall in the Austrian alps. In this case, movement through generic rather than geographically specified space grounds the novel’s reflections on the constraints of female identity, rooting the novel in a more allegorical mode.

Our work is thus tied to prior research in the broader area known as the spatial humanities (Bodenhamer et al. 2010; Roberts et al. 2014). Whether qualitative or computational in nature, this work is grounded in the significance of spatial structures for understanding cultural and narrative meaning. Where prior work often captured space as a static construct (the atlas or map as the principle theoretical frame), the concept of mobility can be a useful addition to this work by taking into account a dimension of narrative time.

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Mobility, then, is a way of understanding the world-building function of fictional narratives. How and where characters move through space is integral to the construction of narrative meaning as much as are the specific qualities of the individual places themselves. Modeling mobility at large scale can thus begin to provide insights into the more general chronotopes that shape storytelling across different cultures, genres, and historical time periods.

Questions of narrative mobility – of what mobility is and how we recognize it – also matter when we consider the significance of mobility for human cultures more generally. For Cresswell 2006, “mobility is central to what it is to be human.” Not only do people move from the moment of birth, but cultures blend, splinter, and evolve. And because mobility carries ideological meanings, it also shapes the stories we tell. As Cresswell emphasizes, the modern Western meaning of mobility is not stable: “[m]obility as progress, as freedom, as opportunity, and as modernity, sit side by side with mobility as shiftlessness, as deviance, and as resistance” (1-2). As *On the Road* suggests, the two understandings of mobility can even coexist within a single text. One of the consistent attributes of mobility is its ability to participate in a shifting process of meaning-making. This paper aims to introduce methods for understanding the dynamics of character mobility within literary narratives as part of a broader goal of understanding how mobility has been framed and understood over time.

In the body of our paper, we first describe and validate the model we use to predict narrative mobility derived from prior work (Soni et al. 2023). We then describe a variety of measurements of mobility based on this model as applied to two primary datasets. The first is the CONLIT corpus of contemporary prose, which includes 2,754 works of English prose published since 2001 drawn from twelve different genres. The second is a collection of 10,629 novels by American authors published between 1789 and 2000.

As a way of understanding the function of the different kinds of mobility we are interested in, we examine the relationship between our mobility measurements and particular social categories. These include the effects on character mobility of fictionality (fictional versus nonfictional narratives), prestige (award-winning novels versus bestsellers), audience age-level, and pronoun-signaled character gender.

2. Data and Methods

2.1 Data

We work with a corpus of 13,383 books published between 1789 and 2021. All books are in English; the large majority are works of fiction. The corpus was assembled from a range of sources as described below. The distribution of volumes across subcorpora is shown in table 1.

All subcorpora except CONLIT contain only fiction. As detailed in Piper 2022, CONLIT contains twelve different genres distributed across fiction and nonfiction writing published in the twenty-first century. Nonfiction genres (820 total volumes) are limited to generally narrative forms including biography, memoir, and history. EAF and Wright comprise subsets of the novelistic fiction by US authors cataloged in Wright 1965 and digitized by a consortium of academic libraries (Digital Library Program 2012; Elec-

Collection	Label	Books	Begin	End
Early American Fiction	EAF	488	1789	1850
Wright Bibliography of American Fiction	Wright	1,052	1850	1875
Chicago Novel Corpus I	Chicago I	2,608	1880	1945
Chicago Novel Corpus II	Chicago II	6,481	1946	2000
CONLIT Contemporary Literature	CONLIT	2,754	2001	2021

Table 1: Subdivisions of the research corpus.

tronic Text Center 2000). Chicago I and II include novels by American authors published between 1880 and 2000, sourced from the Chicago Text Lab (Long and So 2020).

Our corpus offers nearly uninterrupted coverage of American fiction over more than 230 years. It is especially rich in twenty-first-century writing, for which it contains extensive metadata concerning fictionality, prestige, and audience type. When we compare fiction to nonfiction, or use metadata facets that are uniquely tabulated for the CONLIT subcorpus, we limit our analysis to that subcorpus. When we analyze fiction alone, we exclude the nonfiction portion of CONLIT. The corpus as a whole does not include a meaningful amount of writing by non-North American authors, nor writing originally published in languages other than English. For this reason, our analysis and conclusions should be understood to apply primarily to the North American, English-language contexts that are well represented in our source collections.

2.2 Methods

2.2.1 Modeling Sequences of Places

From each volume in our corpus, we extract the ordered sequence of locations associated with each of its characters using the method developed in Soni et al. 2023. In brief, we use BookNLP (Bamman 2020, 2021) to identify characters and locations that cooccur within a rolling ten-token window in each source text. The same system performs coreference resolution, consolidates multiple forms of address to single characters, and records pronominally signaled character genders. We then train a BERT-based model to identify possible relationships (including NO RELATION) between each cooccurring character–location pair. From the full set of cooccurrences, we select those that describe a character as occupying the identified location (having relation IN). This method differs significantly from earlier work, in that it allows us both to place characters in specific locations and to trace character movements over narrative sequences.

The locations identified may be geopolitical entities (GPEs), such as nations or cities, facilities (FACs), such as homes or offices, or other locations (LOCs; typically natural settings). In principle, any of these locations might correspond to real, mappable places (England, Mt. Everest) or to imaginary or generic entities (the house, a street corner, Hogwarts). In practice, most GPEs are real, uniquely identifiable, and mappable; most FACs and LOCs are not.¹ We separate our character sequences into GPEs and others. For GPEs, we retrieve detailed geographic information from open and commercial sources as described in Evans and Wilkens 2018. For non-GPEs, we remove stopwords ([the

1. We resolve coreferences to characters, but not to locations. We thus do not attempt to map diectics such as “here” or “there” to any specific place, nor do we identify whether any two instances of a generic term like “house” refer to the *same* house.

house | a house | her house] → house), but do not perform geolocation. 133

After processing, we have two lists of locations (GPEs and others, respectively) that are 134
 occupied sequentially by each character in each book. In some of our experiments, we 135
 are interested in transitions between locations. We call each case in which a character 136
 occupies a location different from the one immediately preceding it a *hop*. For example, 137
 a character having the GPE sequence [London, Boston, California] undergoes two hops, 138
 London → Boston and Boston → California. If a character occupies the same location 139
 multiple consecutive times, we treat that sequence of unchanging locations as single 140
 instance. For GPE sequences, we exclude hops for which the distance between locations 141
 is conceptually ill-defined, such as London → England or California → USA. 142

2.2.2 Measurements 143

Here we present the primary measures used in our analysis, along with a list of de- 144
 pendent variables analyzed in table 5. In most cases, we restrict our calculations to the 145
 single most commonly occurring character in each book, which we call the *protagonist*. 146
 We condition on protagonists because we observe that the majority of overall mobility 147
 in the average book is associated with the most frequently occurring character. 148

Distance: The total geodesic distance (in miles) between sequences of geographic places 149
 (GPEs) that are inhabited by the book’s protagonist. This represents the sum of the 150
 distances traversed over all valid hops for the character. We exclude a subset of common 151
 hop types that are conceptually ill-defined, including hops between cities and the first- 152
 level administrative regions (states, provinces, etc.) or nations that contain them, and 153
 between first-level regions and the nations to which they belong. We allow hops between 154
 any locations at the same administrative level (city to city, state to state) and between 155
 different administrative levels when the lower-level location is not contained by the 156
 higher-level one (for example, neither Los Angeles → California nor Los Angeles → 157
 United States is allowed, but Los Angeles → Iowa is). We make an exception for hops 158
 involving continents, which we allow (measuring to the geographic centroid of the 159
 continent). 160

GPEs: The count of distinct geographic places inhabited by the main character (e.g., 161
 India, Toronto, New York, California). 162

Generics: The count of distinct generic places inhabited by the main character (e.g., 163
 room, kitchen, street, yard). These are annotated as LOC and FAC by BookNLP. 164

Semantic distance: The average semantic distance between all sequentially inhabited 165
 generic places. Semantic distance is calculated as one minus the cosine similarity 166
 between word vectors for each generic place using the Glove 6B Wikipedia pretrained 167
 model with 100 dimensions (Pennington et al. 2014). Multi-word phrases average 168
 each word’s vector in the phrase. Stop words and punctuation are removed. Semantic 169
 distance aims to capture the semantic similarity of places given a general understanding 170
 of those terms. 171

Deictics: The frequency of “here” and “there” relative to all generic place names per 172
 book. 173

Generic / GPE ratio: The total number of generic locations divided by the total number 174

of GPEs per book. 175

Character count: The count of references to a book’s protagonist. 176

Tokens: The total count of tokens per book. 177

Start–finish miles: The direct geodesic distance between the first and last locations inhabited by the protagonist of each book. 178 179

2.2.3 Independent Variables used for CONLIT 180

The number of documents for each class are listed in parentheses. 181

Fictionality: The category designation between FIC (fiction; 1,934 volumes) and NON (nonfiction; 820). 182 183

Prestige: Sub-divided between genre labels PW (prizewinners; 258) for high prestige and BS (bestsellers; 249) for low prestige. 184 185

Youth: Sub-divided between genre labels MID (middle-grade books; 166) and NYT (*New York Times* reviewed), PW, and BS (926). 186 187

Female: Uses the inferred gender categories “she/her/hers” (744) and “he/him/his” (1,180) for protagonists in fiction. The very small number of other pronominal designations are removed. 188 189 190

2.2.4 Distance Validation 191

The computational pipeline by which we produce our hop sequences and distance measurements is complex and subject to multiple uncertainties. To validate our results, we examined 10,000-word chunks extracted from the beginning of 30 novels sampled at random from the CONLIT subcorpus. For each sample, we annotated by hand the set of true geographic locations occupied by the main character; determined the geographic coordinates of those locations; and calculated the distance traversed by that character. We also labeled each sample’s holistic mobility from 1 (lowest mobility) to 5 (highest mobility). We found that our algorithmic distance was linearly correlated with human measurements at $R^2 = 0.525$ ($p \approx 0$ by permutation against a null hypothesis of no relationship between the measurements). We also found that the mean distance traveled by protagonists in high-mobility samples (those with ratings of 4 or 5) was much higher than the mean distance traveled in low-mobility samples (ratings 1 or 2; $\bar{x}_{high}/\bar{x}_{low} = 3.6$; $p < 0.008$ by permutation of the group labels against a null hypothesis of no difference in the group means). We note as well that randomly distributed errors in our pipeline will tend to reduce the observed significance of results derived from our data, hence that we generally understate the statistical significance of our findings (see Spearman [1904] 1987). We are thus confident that our GPE-derived distance measures serve in aggregate as an acceptable class of proxies for character mobility. 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209

2.2.5 Regression Analysis 210

To evaluate the impact of each social category, which serve as our independent variables, we conducted a linear regression analysis. For this analysis, we incorporated binary dummy variables corresponding to each primary class, namely fiction, prestige, youth, 211 212 213

and female character. Additionally, we introduced control variables to account for potential confounding factors, such as genre, point of view, book length (measured in tokens), and character mention frequency (character count).

The outcomes of this analysis, including the directionality of the effect for each dependent variable and the statistical significance represented by p -values, are summarized in table 5. In our supplementary materials, we present comprehensive results, encompassing sample mean estimates, R^2 values, and the precise p -values obtained from the analysis.

It is important to acknowledge the significance of our chosen control variables due to the variability they exhibit in our data. For instance, nonfiction texts exhibit a higher average length compared to fiction, whereas fiction registers a markedly higher average character count, with fictional protagonists being referenced significantly more frequently. Consequently, employing a uniform normalization technique would be inadequate to address the multifaceted disparities inherent in our dataset.

3. Results

Overall Distance. In table 2, we show the mean distance traveled, mean number of unique GPEs, and mean number of unique generic locations in each of our subcorpora.² Figure 1 visualizes the evolution in these quantities over time. As we can see, the average number of unique places, whether GPE or generic, has more than doubled since the nineteenth century, as has the total distance traveled by primary characters.

Collection	Distance	GPEs	Generics	Hops
EAF	13,139	5.9	37.5	5.8
Wright	10,477	5.3	43.8	4.9
Chicago I	21,026	8.4	72.9	9.3
Chicago II	37,023	13.8	113.0	16.3
CONLIT fiction	38,024	13.3	123.9	15.6
CONLIT nonfiction	131,263	35.8	120.8	60.8

Table 2: Means of distance, number of unique GPEs, number of unique generic locations, and number of hops by subcorpus.

Routes Traveled. Figure 2 presents a global map capturing the movement by protagonists between places in fictional narratives. This figure plots the aggregate hops taken by all fictional protagonists over the full corpus; the width of the line connecting each (undirected) origin and destination is proportional to the share of all hops represented by that location pair. While we visualize here only the aggregated results for the full corpus, the supplemental materials provide visualizations by subcorpus and by historical era. There is very little variation in the high-level appearance of this map over historical time. As table 3 further illustrates, the patterns of movement between places within (broadly American) fiction are highly stable and formulaic over historical time.

Gender and Mobility. Previous work has found that novels enriched in she/her charac-

2. Median values of these quantities are lower, since their distributions include a long tail of large values, but the observed historical trends and relationships between subcorpora do not differ meaningfully under that metric. The same is true of the total (as opposed to unique) number of GPEs and generic location mentions. Full results are available in the supplementary material.

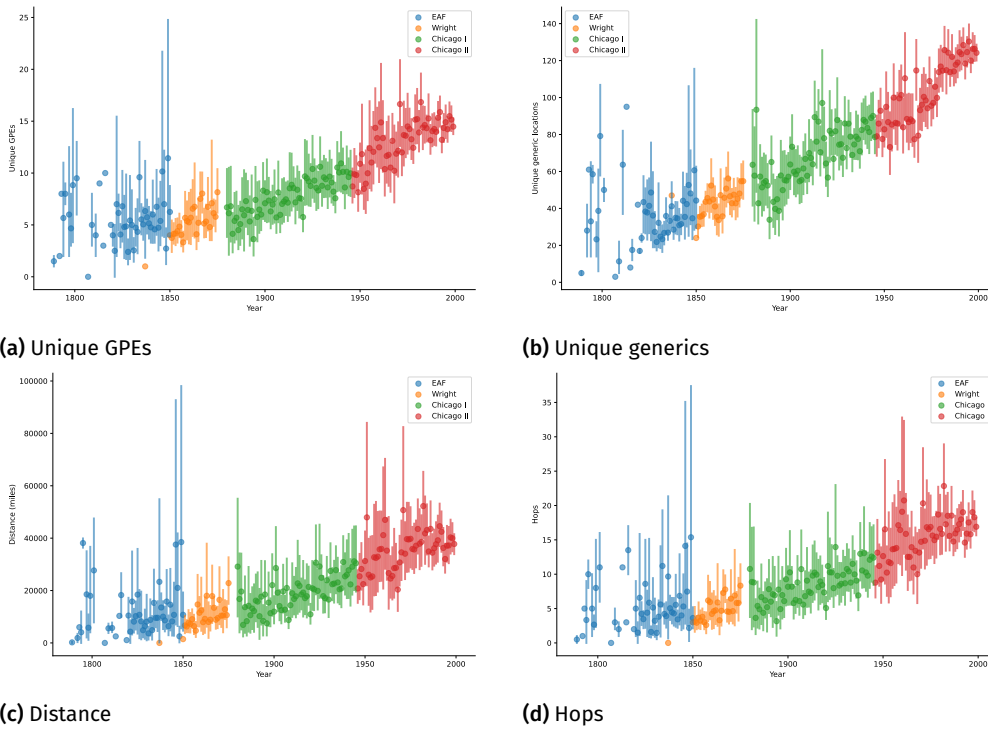


Figure 1: Unique GPEs, unique generic locations, protagonist distance, and hop count over time by subcorpus and year. Markers represent yearly means; bars are 95% confidence intervals.

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GPEs	Most frequent hops
New York	America*, Paris, Manhattan*, London, New York City*, Chicago, California, Brooklyn
London	New York, England*, Paris, America, France, Boston
America	New York*, London, England, California*, Paris, China, India
Paris	France*, New York, London, Chicago, England, Europe
California	New York, Los Angeles*, San Francisco*, America*, Chicago, London, San Diego*, Boston
Generics	Most frequent hops
room	house, home, kitchen, bedroom, school
house	room, home, kitchen, living room, bedroom
home	house, room, kitchen, school, apartment
kitchen	house, room, home, living room, bedroom

Table 3: Most frequent inhabited locations in the fiction facet of CONLIT, followed by the most frequent subsequent locations (“hop”) in descending order of frequency. Destinations marked with an asterisk (*) are examples of hops excluded from distance calculations, because their distance from the origin is ill-defined. Such hops are common.

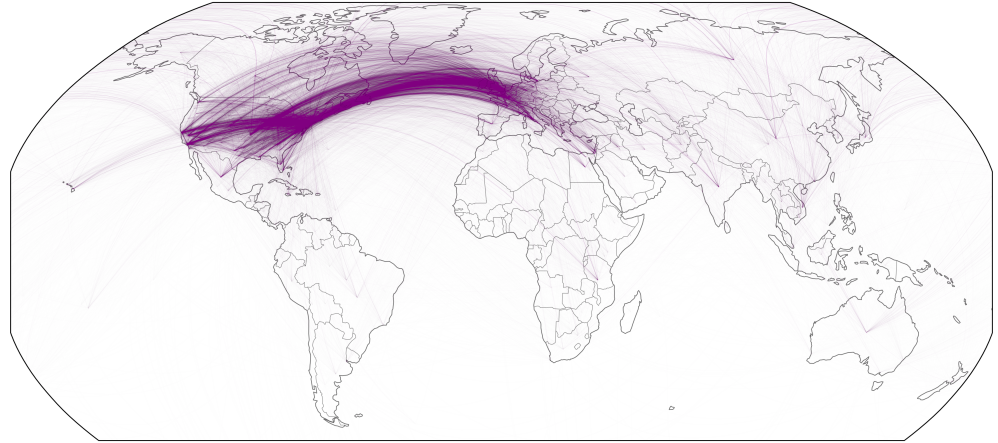


Figure 2: Aggregated character hops in the corpus. Line widths are proportional to the total number of hops between each pair of locations.

ters contain fewer GPEs and that the GPEs in those narratives are less widely separated 244
 than are those in he/him-enriched novels (Evans and Wilkens 2024). As shown in table 245
 4, we calculate the mean distance traveled and the count of unique GPEs and generics by 246
 pronominally indicated character gender. We find over the full corpus that the average 247
 male-gendered protagonist in fiction occupies more unique GPEs, fewer unique generic 248
 locations, and covers slightly more ground than does the average female-gendered 249
 protagonist. But, surprisingly, the difference in distance traveled is not statistically 250
 significant either in aggregate or within the individual subcorpora. 251

Feature	she/her	he/him	<i>p</i>
Distance (miles)	29,943	31,134	0.1990
Unique GPEs	11.08	11.85	0.0008 ***
Unique generics	102.0	95.8	0.0008 ***

Table 4: Key mobility metrics by narrativized character gender in fiction in the full corpus.

Social Effects on Mobility. Focusing specifically on the contemporary data, we measure 252
 the effects of different social categories on character mobility using the regression 253
 models described above. As shown in table 5, we find that both fictionality and intended 254
 audience age-level have the strongest negative association with mobility, i.e., both 255
 categories significantly lower the distance traveled and the frequency of place names 256
 mentioned (both GPE and generic). We also observe a greater reliance on generic place 257
 names in both of these categories. Finally, as with the full corpus, we find that, after 258
 controlling for genre-related factors, there is no meaningful difference in the distance 259
 traveled between differently gendered characters. 260

In addition to our regression analysis, we also seek to identify ways in which mobility 261
 may differ *qualitatively* even when overall quantitative levels are similar. We employ the 262
 Fightin' Words method of Monroe et al. 2017 with an informative prior to identify GPEs 263
 and generic places that are over- and underrepresented in facets of our corpus (figure 264
 3).³ 265

3. Specifically, we use the method described in Monroe et al. 2017, section 3.5.1, equation 23, with an informative Dirichlet prior calculated over all volumes in the corpus.

Measure	Fictionality		Prestige		Youth		Female	
	valence	<i>p</i>	valence	<i>p</i>	valence	<i>p</i>	valence	<i>p</i>
Distance	-	***	+	.	-	***	+	.
GPEs	-	***	-	.	-	***	+	.
Generics	-	***	+	.	-	***	+	***
Semantic distance	-	*	+	***	+	.	-	**
Deictics	+	***	-	***	+	.	-	.
Generic/GPE ratio	+	***	+	.	+	***	+	.

Table 5: Results of regression analysis for each measure across our primary categories in the CONLIT subcorpus. Valence captures whether the estimate for the primary category (e.g. fictionality) is lower or higher than its opposite (e.g. nonfictionality). We provide standard significance codes (*** < 0.001, ** < 0.01, * < 0.05, . ≥ 0.05). Full results, including the estimates and *R*² values, are supplied in the supplementary material.

We observe that contemporary fictional narratives are often enriched in imaginary, extraterrestrial, historical, and otherwise “peripheral” GPEs (Maine, Taos, Sri Lanka) relative to nonfictional narratives, which are themselves enriched in sites of political power and armed conflict. Fiction is also enriched in generic locations that are private and semi-public interior spaces, whereas nonfiction preferentially locates its characters in public sites of power and work.

Within fiction, we find that she/her characters are distinctively located in major and evocative urban localities; he/him characters are assigned preferentially to historical and contemporary sites of power and to those of American political and armed conflict. Generic locations are distributed by gender in ways that resemble their allocation between fiction and nonfiction, she/her characters occupying domestic interiors, he/him characters disproportionately found in public, power-infused sites.

4. Discussion

Our results paint a clear picture of the spatial constraints of fictional worlds. When compared with nonfictional narratives, characters in contemporary fiction travel less distance, visit fewer geographic and generic places, inhabit generic places that are semantically more similar to each other, and rely far more on generic places than on geographic ones. They also utilize deictic markers like “here” and “there” with far greater frequency. Fictional worlds are smaller worlds, both geographically and semantically.

Interestingly, we see little effect on these measures if we examine social categories like prestige or gender. Prizewinning novels do not travel further or utilize more geographic places when compared to more market-driven fiction. They do tend to use fewer deictics and employ more semantic diversity among non-geographic places, suggesting greater sophistication at the level of vocabulary. Books aimed at middle-school audiences generally describe far more limited narrative worlds, as would be expected.

The results concerning character gender are surprising, given our assumption that she/her characters would more likely be associated with social constraints affecting their mobility. This turns out not to be the case. For both the historical and contemporary data, women were no more likely to be associated with diminished levels of mobility after controlling for confounding variables.

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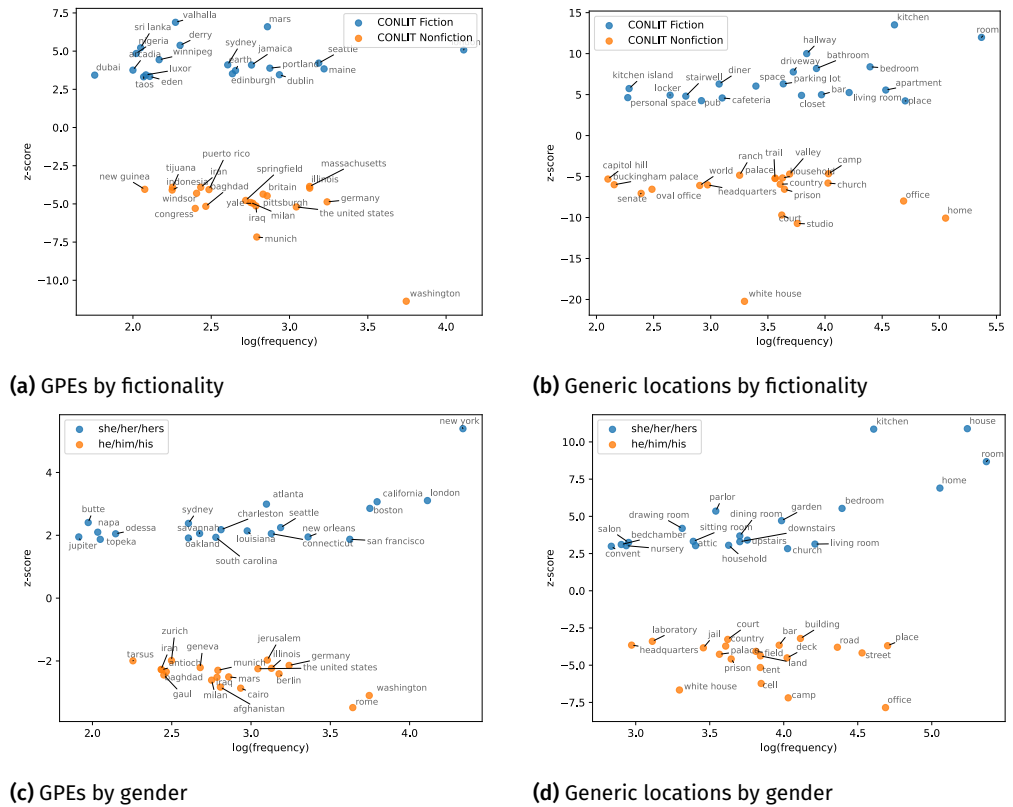


Figure 3: Distinctive location use across fictionality and character gender facets in CONLIT. The x -axis represents the log of the frequency of each term in the indicated corpus; the y -axis represents the z -score of the term in the indicated facet relative to the other facet, informed by a weighted prior calculated over the full corpus.

At the same time, when we examine the distinctive places associated with she/her 296
 characters, we do see more expected outcomes. She/her characters are more likely 297
 than he/him characters to be associated with domestic, private, and semi-public spaces. 298
 If we compare the results for fiction and nonfiction presented in figures 3a and 3b to 299
 those for character gender in figures 3c and 3d, we see how the locations distinctively 300
 occupied by she/her and he/him characters map closely to those of fiction and nonfiction 301
 protagonists, respectively. While we are not yet in a position to assert a blanket spatial 302
 homology between fictionality and gender, the resemblance is sufficiently suggestive to 303
 merit further investigation. 304

In addition to these small-world effects at the level of physical distance, we also find that 305
 the *connections* between geographic places in fictional worlds are remarkably predictable 306
 (figure 2). Fictional worlds are “small” not just in the sense of the overall distance 307
 characters travel, but also in the diversity of places they move between. We observe 308
 a NATO- or grand-tour-driven center surrounded by a much less traveled periphery. 309
 Fictional characters spend their time moving around a very small portion of the world. 310

These results accord well with previous work that examined the distribution of named 311
 locations (without regard to character associations) in British and American fiction 312
 (Wilkins 2016), though there exists some evidence suggesting that British fiction under- 313
 went greater evolution of its geographic imagination over the twentieth century than 314
 did American (Wilkins 2021). Future work could begin to replicate these methods for 315

more geographically diverse fiction produced around the world to model the spatial 316
 archetypes of mobility. Does every region or national literature have its spatial center 317
 of gravity and its exotic periphery? To what extent are centers and peripheries shared 318
 across nations, languages, and periods? Is every regional literature as constrained as the 319
 North American example, or do other regions have very different network structures of 320
 mobility? 321

When it comes to changes in mobility over historical time, we see that the distance 322
 traveled by fictional characters has been increasing, as have the number of GPEs and 323
 generic places. One of the drivers of this phenomenon is that fictional narratives have 324
 also been getting longer over time, while the frequency of references to the main character 325
 has been increasing as well.⁴ If we normalize by book length, we still see meaningful 326
 increases over time; if we normalize by character count (that is, by the number of all 327
 character references that pertain to the protagonist), we see slower growth in distance 328
 traveled and essentially zero rise in the count of unique GPEs (figure 4). The same is true 329
 when we compare highly protagonist-centered first-person narratives to more widely 330
 character-dispersed third-person alternatives. What this tells us is that, as books have 331
 become longer and more protagonist-centered, main characters are traveling relatively 332
 further and moving between geographic places more often, but much of this growth can 333
 be accounted for by the sheer increase in character references (allowing for more places 334
 to be counted and thus more distance to be traveled). There does not appear to be an 335
 obvious ceiling on the range or rate of protagonist mobility, even in long books with 336
 potentially saturated story worlds. That said, we are surprised that, over a sustained 337
 period of increasing access to fast, safe, and reliable transportation, we do not observe 338
 more sharply rising distances traveled by protagonists after controlling for narrative 339
 length and protagonist concentration. This fact may suggest narrative constraints on the 340
 density or variety of geographic locations that can be easily accommodated in long-form 341
 fiction. 342

The final way in which we understand the small-world effect of fiction is through our 343
 examination of the lexical differences between spatial entities in fiction when compared 344
 with nonfiction (figure 3). When we do so, we quickly confirm several differences 345
 that we might have expected, but have not previously quantified. Compared to fiction, 346
 nonfictional narratives overrepresent sites of power, including official political locations 347
 like White House, Oval Office, Senate, Washington, Buckingham Palace (and “palace” 348
 generically), and Capitol Hill; sites of carceral power (court, prison); workplaces (studio, 349
 office, headquarters); and locations of present and historical conflict as experienced 350
 primarily from the United States (Baghdad, Iraq, Iran, Munich, Tijuana). Fiction, by 351
 contrast, overrepresents domestic and semi-public spaces (kitchen, hallway, bedroom, 352
 bathroom, apartment, cafeteria, pub, and many more), driveways, and parking lots. As 353
 has long been theorized, fiction is preëminently occupied with domestic and private 354
 space (Armstrong 1987; McKeon 2006). 355

On the other hand, the distinctive geographic spaces of fiction are often extremely distant 356
 or otherworldly (Valhalla, Mars, Arcadia, Eden). Fiction compensates for its small- 357
 world effects – either in the real world or through generic private spaces – by investing 358

4. We note in passing that these measures of average book length and protagonist concentration over nearly 250 years of North American literature are novel in the critical and computational literature. They likely merit future investigation.

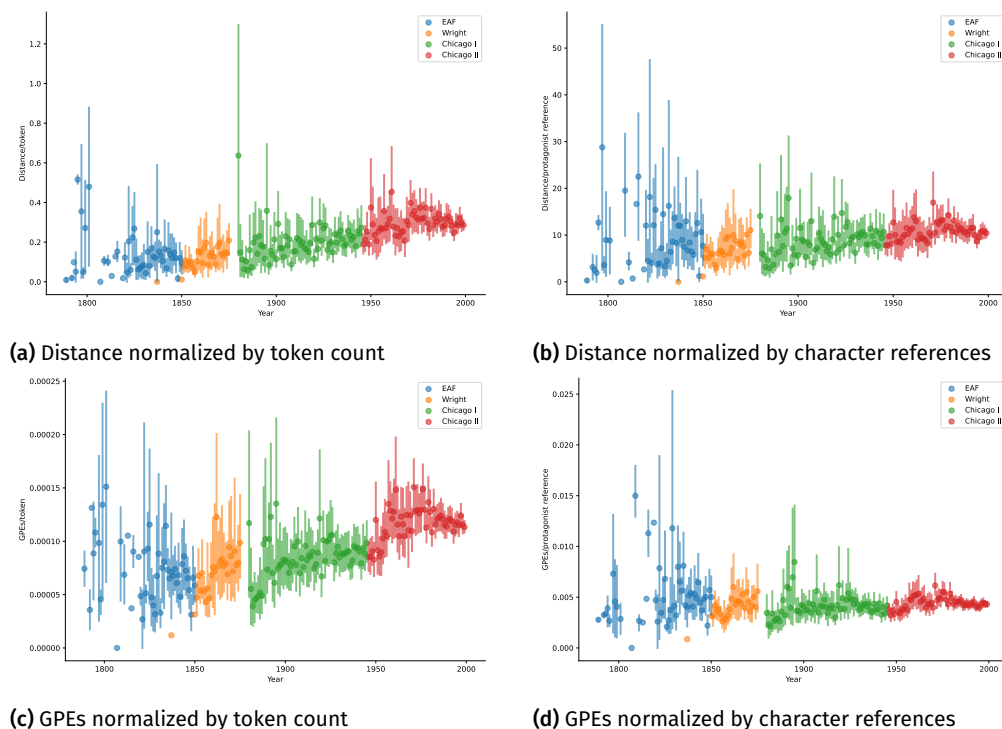


Figure 4: Average fictional protagonist distance and count of unique GPEs by year and subcorpus, normalized by volume length or by count of character references.

at least partially in telling narratives focused on the most distant places imaginable.⁵ 359
 It is worth considering what a new genre of fiction might look like that inverted this 360
 escapism–power dynamic and focused instead on immersing readers in the central 361
 locales of power and punishment rather than the private chambers of imaginary locales. 362

The major limitation of our study, beyond the need for cultural expansion, is that our 363
 models cannot account for distances between unreal places or extraterrestrial locations, 364
 which are identified by our entity model, but are not easily localizable in terrestrial 365
 space. One could argue that the role of genres like fantasy and science fiction is precisely 366
 to undo the small-world effects of fiction (Dubourg and Baumard 2022). In simulating 367
 vast travel, they reverse the constraints of fictionality. At the same time, the fact that we 368
 see these genres still exhibiting lower diversity of generic places and higher semantic 369
 constraints between them relative to nonfictional narratives suggests a basic conflict 370
 between the expansiveness of space (“to the moon and back”) and the constraints of 371
 fictional places that are limited to rooms, vehicles, and home-like structures. 372

5. Conclusion 373

Our project has attempted to add two important methodological dimensions to prior 374
 research on literary spaces. First, relying on new models that locate characters in space 375
 (Soni et al. 2023), we are able to give a *character-centred* account of fictional spaces. 376
 Second, by studying the sequencing of spatial presence we are able to observe the effects 377
 of narrative time on the construction of space, for which we employ the term “character 378

5. We say at least partially because these are not the most common locations in contemporary fiction (which are all-too-familiar places like New York, London, and America). Rather, these are the locations that are present at modest rates in fiction and that are virtually absent from works of nonfiction.

mobility.” 379

Applying our models to a large collection of historical and contemporary Anglophone fiction, we make the following key observations concerning the small-world effects of fiction: 380
381
382

1. **Fictional worlds are small in the sense of the distance traveled by characters.** 383

When compared to the movements of nonfictional characters (subjects of memoirs, biography, or historical narratives), fictional protagonists travel less than half the distance of their nonfictional counterparts. Generic places are also much more common and far more semantically similar than is the case in nonfiction. 384
385
386
387

2. **Fictional worlds are small in the constrained routes that characters travel.** Fic- 388

tional characters stick to a very familiar set of pathways that leave much of the world un- or under-explored. 389
390

3. **Fictional worlds are semantically small in the types of generic spaces they foreground.** 391

Fictional characters are much more likely to be located in domestic or private spaces when compared to their nonfictional counterparts. 392
393

4. **Fictional worlds have been expanding over historical time.** The distance traveled 394

by fictional characters has doubled since the nineteenth century, but much of this increase can be accounted for by the increased centralization of main characters. 395
396

5. **She/her characters do not move less, but they do spend more time in the kitchen.** 397

Insights into the gendered nature of mobility reject assumptions about the spatial limitations of women characters, but support their over-representation within domestic spaces. 398
399
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We look forward to continuing this work to gain a deeper and more culturally diverse understanding of the relationship between fictional narratives and character mobility. 401
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6. Data Availability 403

Data and supplementary materials are available at <https://github.com/wilkens/sma-ll-worlds> 404
405

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8. Author Contributions 411

Matthew Wilkens: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, validation, visualization, writing - original draft 412
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Elizabeth F. Evans: formal analysis, writing – review & editing 414

Sandeep Soni: methods, data analysis, software	415
David Bamman: funding acquisition, methods, resources	416
Andrew Piper: conceptualization, data curation, formal analysis, project administration, investigation, writing – original draft	417 418

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