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Asking for Occupation during the Interview

Experimental Results

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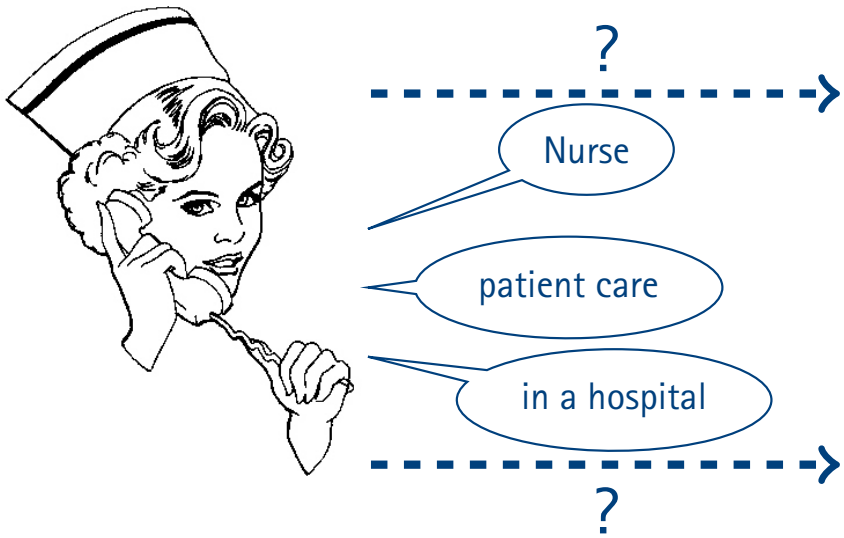
The Coding Problem

Assign verbatim answers into an official classification

Survey Answers



Classification

KldB 2010	Job Title
81302	Nurse
81313	Graduated Nurse
81323	Pediatric Nurse
⋮	⋮
81102	Doctor's Assistant
82102	Geriatric Nurse

Category 81302 (Nurse) most plausible but other categories are possible as well

Which Classification?

Classifications

- International Standard Classification of Occupations, 2008 (ISCO-08)
  - 567 unit groups at the finest level
- German Classification of Occupations 2010 (KldB 2010)
  - Extensive classification with 1286 categories und 2500 pages of documentation
- Internal Classification (DKZ) used by the German Federal Employment Agency
  - Several thousands of job titles (8 digit codes)
  - First five digits are identical with the KldB 2010
  - Transition table exists to convert most titles to ISCO-08
- DKZ was used in this project
- Evaluation only for KldB 2010 because practical obstacles impeded conversion to ISCO-08

Coding Quality

Intercoder-Reliabilities for various classifications

- 42-89%, with high variation depending on study population and coding design (Mannetje and Kromhout (2003), Campanelli et al. (1997), Elias (1997), Drasch et al. (2012), Prigge et al. (2013), Maaz et al. (2009))

Proportion of Codable Answers

- 24.9% of all answers are not precise enough for coding in ISCO-88 without doubt (Hoffmeyer-Zlotnik et al., 2004)

What are the reasons for low quality?

Error Sources in Manual Coding

Wrong and Imprecise Answers

- Example: Respondent answers „Welder" but works at a car workshop.

Coder's Concentration Errors

- When coders become exhausted, errors may happen

Coding Rules

- Rules have the risk to induce systematic biases
- Examplary rule: If various codes are possible, select that occupation that is less specialiced (Geis (2011))
- This rule will lead to an underrepresentation of highly specialized occupations

Can we do better?

Coding during the Interview

Idea

- Suggest possible job titles automatically
- Respondent decides which category fits best

Objectives

- Additional inquiries raise the quality for ambiguous answers
- Reduce costs for manual coding

Examplary Question Sequence

1. Question: Please tell me which occupational activity you pursue.
   Answer: „Vice principal and teacher"
2. Question: Please describe this occupational activity precisely.
   Answer: „German, Math, and Arts"
   - Only asked for control
   - Average response time of 45 seconds could be saved
3. Question (later in the interview): „Do you pursue one of the following occupations?

   ```
   (84114, selected) Teacher - Primary School
   (84124) Teacher - Secondary School (Hauptschule)
   (84124) Teacher - Secondary School (Realschule)
   (84214) Teacher - Vocational School
   (84503) Sports Teacher
   **** or is it a different occupation? ****
   ```
4. When the last option is selected: Manual coding as hithero

Strenghts and Weaknesses in the Example

Strengths:

- Respondent chooses a plausible category
- Without the follow-up question, we would not know that this person is a "teacher at a primary school" (category 84114)

Weaknesses:

- Both secondary school categories should be combined to a single answer option to safe place
  - Current classification is not well-suited
- No occupation shown from the KldB-category 84194 "Leaders in general school system"
  - Better algorithms/more training data may help
  - Manual coding leads to this category because "vice principal" was mentioned first
  - KldB is ambitious for this occupational activity

Technical Details

Target Classification

- Job titles from the internal DKZ-classification are suggested, in our version with 11.194 job titles
- DKZ codes converted to KldB 2010 to check the quality

Algorithm (cf. Schierholz (2014))

- Correctness probabilities are calculated for all job titles in parallel
- Five most probable titles are suggested to the respondent (out of dozens of possible titles the algorithm finds)
- Supervised learning algorithm: Boosting
- Learning system that will improve when more coded answers are fed into the system

IT-Setup

- interview software NIPO from the telephone studio communicates with a server running R for computations

Data

Live-Test

- Instrument was tested in a phone survey at IAB
- 1064 employed respondents
- Two independent professional coders for validation
- Student assistant checked both manual codes and the code from the interview

Training Data

- Predictions are based on ALWA training data (N = 32 882 coded answers)
- Additional Input: 175 000 job titles from various data bases

Results I

How many answers can be coded during the interview?

Number of employed respondents	1064	100%
Respondent selects a suggested job title	770	72.4%
Respondent selects a "different occupation"	145	13.6%
Machine learning algorithm without suggestion	106	10.0%
Other (not analyzed due to small case number)	43	4.0%

- 251 employed respondents (23.6%) remain without coding. Improvements in the target classification and in the algorithm can reduce this proportion
- Special experimental conditions for 43 respondents

Results II

How is the quality for those 770 respondents who select an occupation?

	Man 1		Man 2	
No. Respondents	754	100%	770	100%
Agreement with manual coding	467	61.80%	511	66.23%
No agreement	287	38.20%	259	33.77%

- Inter-Coder Reliability: 61.11% (1039 Codes) / 65.78% (with the same 754 Codes as in Man 1)
- Agreement rates for all three codings approximately equal suggesting similar quality in each
- What about those 368 answers where at least one professional coder disagrees with the code from the interview? (48% of the sample)

Results III

Student assistant evaluated quality for doubtful codings

Code quality

	Man 1		Man 2		Interview	
No. Respondents	368	100%	368	100%	368	100%
Acceptable	257	70%	225	61%	215	58%
Uncertain	68	18%	62	17%	82	22%
Wrong	43	12%	81	22%	71	19%

- Quality for respondent's self-coding is competitive with *Man 2* but worse than *Man 1*

Any systematic reason for errors at interview coding?

Exemplary Wrong Coding

Interview Answer

- Occupation: "Clerk in a dental office"

Suggestions from the algorithm:

```
(71402, selected) Office worker/Clerk
... more ...
**** or is it a different occupation? ****
```

Difficulties:

- Category 73222 would be correct ("Administrative occupations in the welfare and health care system")
- Algorithm does not make any good suggestion
- Selected title is too general

Quality improvements?

Original goal: Increase quality for ambiguous answers

Findings

- Traditional coding: Inexact verbatim answers are often problematic
- Interview coding:
  - Improvements only for very few respondents
  - Difficulty: Suggesting job titles to respondents is not helpful

Discussion

- Coding during the interview is technically feasable but complex
- $>$ 70% of all respondents can be coded during the interview
- If the second open-ended question is replaced by the new instrument, the interview duration will not increase much
- Error rate is competitive with one but not with the second professional coder
- Few systematic errors happen
- Objective to collect additional details for higher quality in interactive mode was not achieved

Several additional improvements suggested before practical application is advised

Plans for Future Improvements

- Auxiliary classification needed ...
  - ... that allows unique mappings to both classifications KldB 2010 and ISCO-08
  - ... with precise occupational descriptions to avoid that respondents select the wrong category
- Discrepancies in respondent's answers should trigger a question about correctness
- More training data and better algorithms can improve the whole system
- Some jobs fit equally well in multiple categories. Abolish coding restriction that only one category is correct.

Renewed test envisaged

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Multiple Categories in the KldB possible: Example

Answers from the Interview

- Occupational activity: “Working group leader at the university” - “Research group, pre-clinical research” - “Immunologist”

Possible categories:

- 41274 Occupations in human biology (Immunologist belongs in this category)
- 41294 Managers in biology
- 84304 Teachers and researcher at university and colleges

Example for Auxiliary Classification

Tätigkeit	Kaufmännische Tätigkeit im Luftverkehr	Betreuung von Fluggästen während des Fluges	Beratung und Betreuung von Fluggästen am Flughafen
Beispiele	aus Bd. 2	aus Bd. 2	aus Bd. 2
DKZ	Luftverkehrskaufmann, Duty-Officer	Flugbegleiter, Purser	Luftverkehrskaufmann, Luftverkehrsassistent, Servicekaufmann - Luftverkehr, Bodenstewardess
ID	51642-1	51422-1	51422-2
ISCO-08	4323	5111	4221
Ähnlich	51422-2	-	51642-1
Zusatzfrage	Weiterbildung zum Fachwirt?	-	-

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