Norsk Regnesentral
NORWEGIAN COMPUTING CENTER

SAFERS:

Talegjenkjenning og maskinlæring for nødmeldetjenester

AMIS Forum,

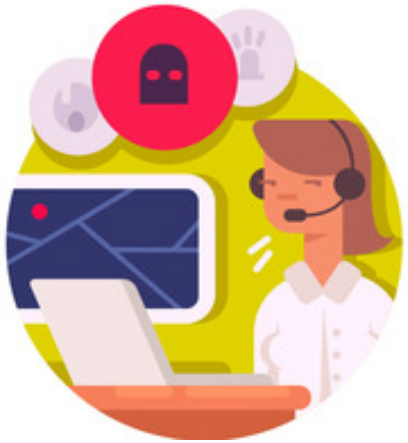
8. februar 2018

SAFERS forprosjektet (april-des. 2017)

Formål: Utrede bruk av nye teknologiske metoder for sanntidsanalyse av nødanrop

- *Transkribere* anropene ved bruk av talegjenkjenning
- *Prediktere* kritiske opplysninger basert på kontekst

Hvorfor?



- **For nødmeldetjenester:**
  - Enklere dokumentasjon og søk
  - Oppdage mulige feil, mangler eller avvik
  - Tidsbesparelser

- **For IKT-forskning:**
  - Nye metoder for talegjenkjenning på telefonsamtaler
  - Prediksjonsmodeller for nødsituasjoner
  - Personvern og taleteknologi
  - …

Projectpartnere

FoU-partnere med kompetanser i tale- og språkteknologi, statistisk modellering og maskinlæring

Nasjonalt kompetansesenter for helsetjenestens kommunikasjonsberedskap

Privatleverandør av talegjenkjenninsløsninger

SAFERS status

- Forprosjektet finansert av Forskningsrådet (0.5 MNOK) gjennom IKTPLUSS programmet
  - Finansiering delt i 2 faser
  - Evaluering av et internasjonalt fagpanel
- Desverre var SAFERS ikke blant de valgte prosjektene!
- Men vi fikk imidlertid noen interessante resultater

Achievements Phase 1

- Collect real-world data from emergency calls.
- Obtain transcriptions for these calls.
- Evaluate the performance of existing speech recognition systems.
- Develop predictive models of emergency events.
- Make SAFERS known to the emergency services community & involve them in the process

- **5 000** events
- **300** calls
- **11** hours of transcribed speech data

Conclusions

The results of Phase 1 confirm that:

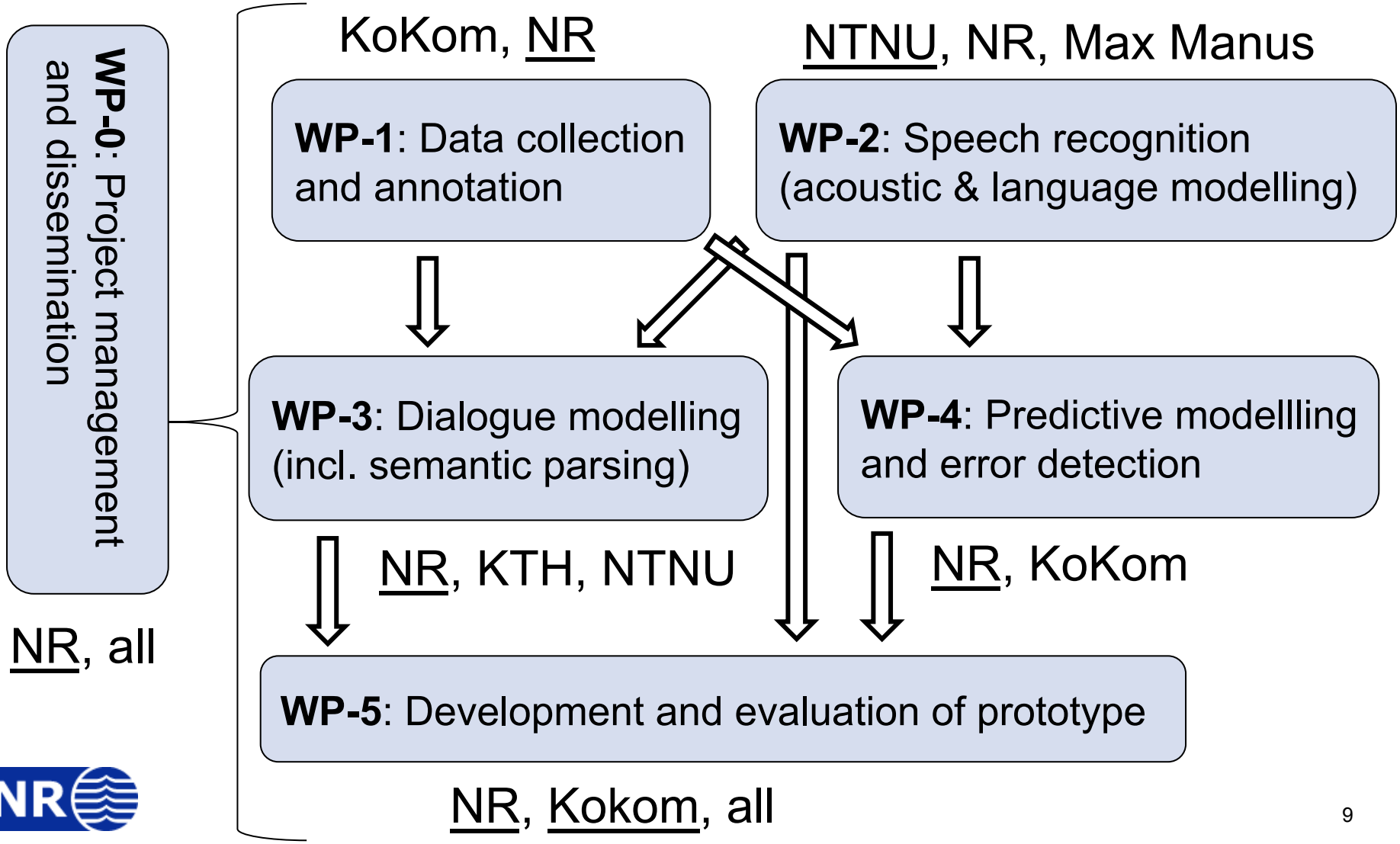
- The key ideas behind the SAFERS project are both **scientifically sound** and **technically feasible**
- Off-the-shelf speech recognition systems are inadequate for transcribing emergency calls

  → Need to develop acoustic and language models **specifically optimised** for emergency calls
- The objectives of SAFERS are **well-aligned** with the needs of emergency response services

Advisory Board

- **Sven Bruun**, acting as a representative from the Norwegian Directorate of Health.
- **Marielle Bakklund**, who is the director of the emergency communication centre in Bodø.
- A representative from **Locus Public Safety AS**, a provider of IT solutions for the emergency sector.
- **Andreas Søeborg Kirkedal**, a speech researcher (working at Interactions, LLC.) who participated in developing a similar system in Copenhagen.

Implementation



Implementation

- Updates:
  - New subtask on privacy-preserving speech processing
  - Remove subtask on detecting prank calls?
- Practical organisation:
  - No change to the management structure
  - Bi-weekly telephone meetings + project group on Telegram
  - Yearly meetings to discuss ongoing work, present existing achievements and plan upcoming R&D effort
  - Use of github and ArXiv for scientific dissemination

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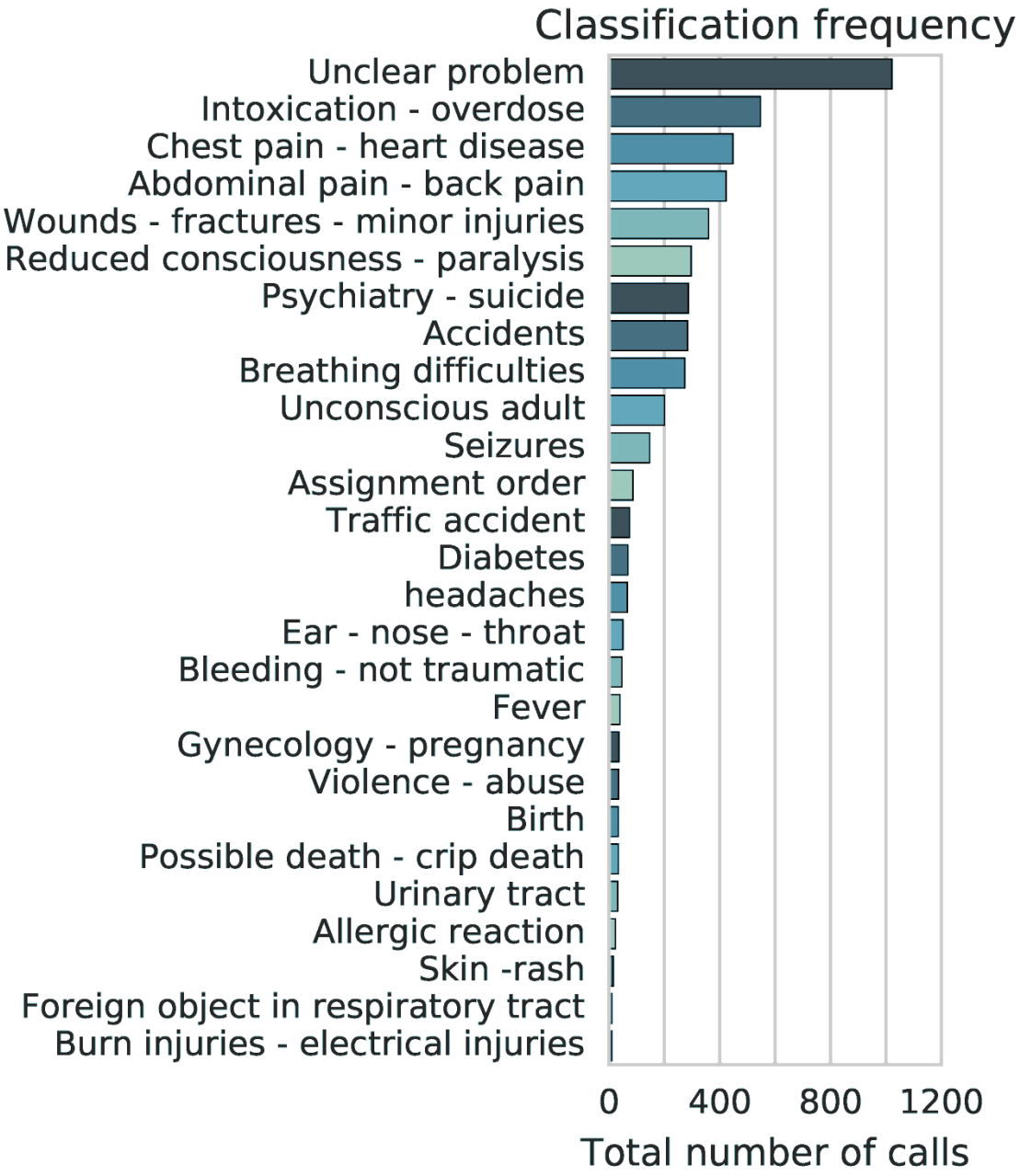
Speech recognition results

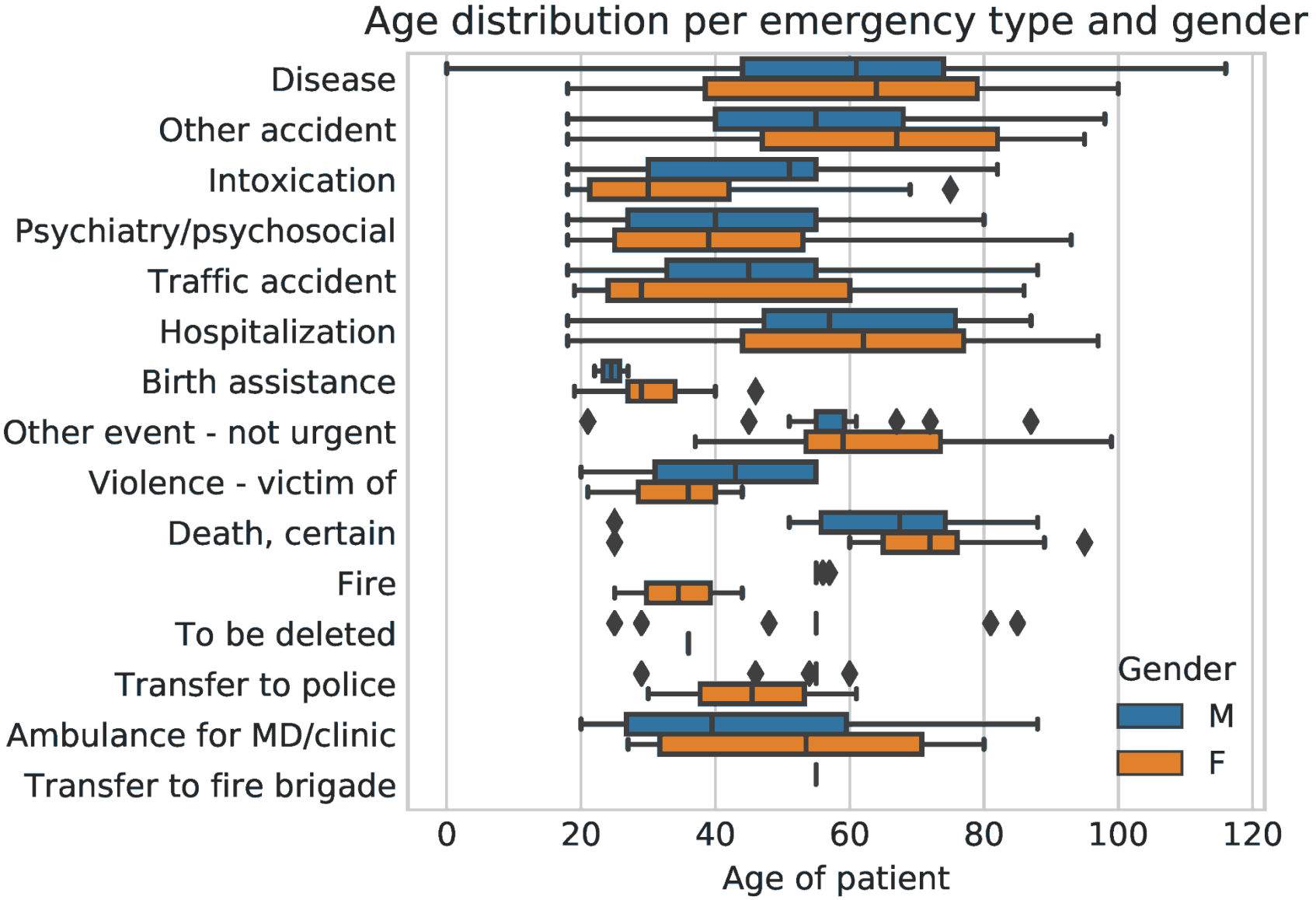
- Dictation systems: unusable (90% word error rate)
- Telephone-based models:

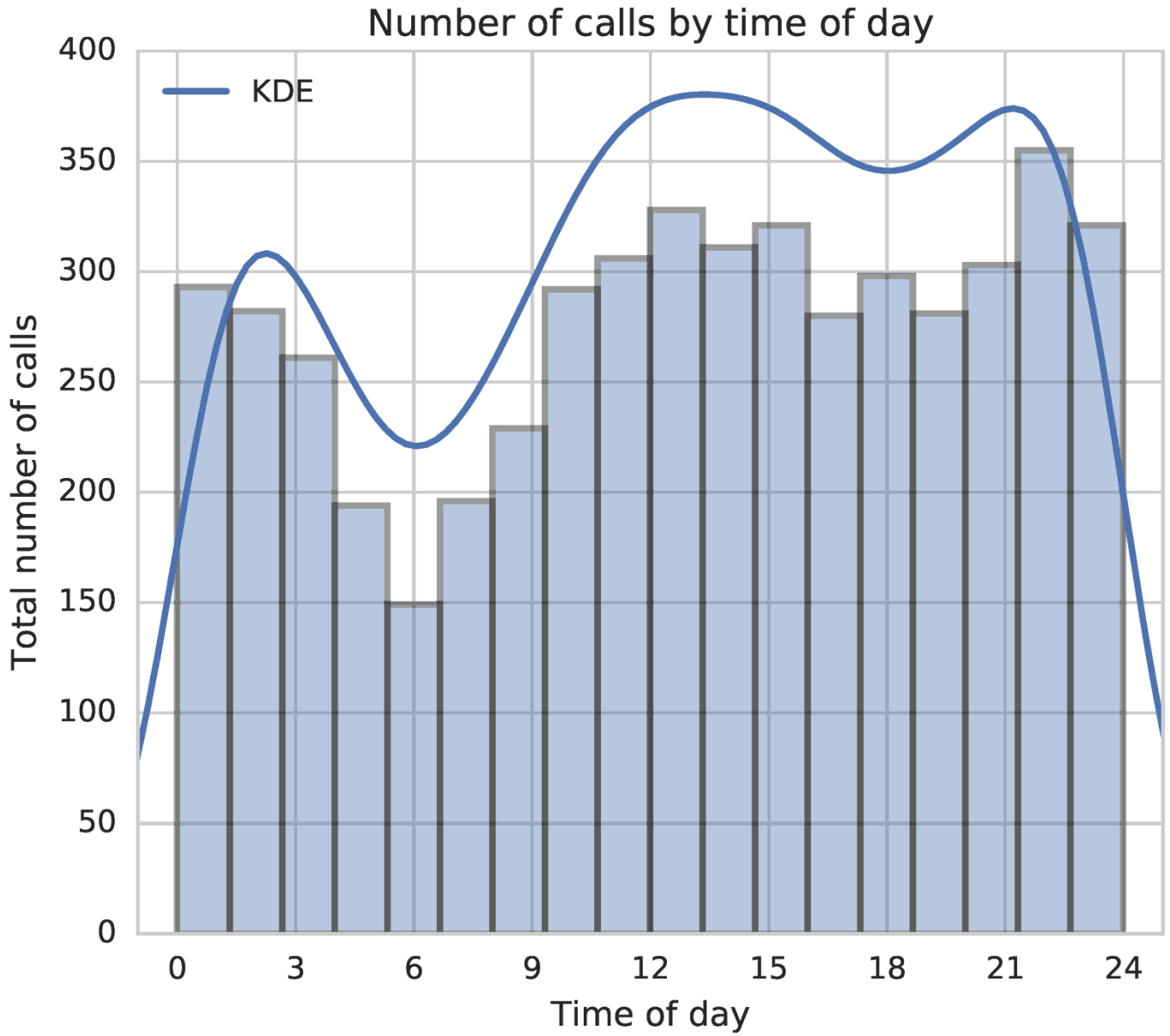
	No LM adaptation	*Language Model Adaptation (by number of transcriptions used for training)*		
		50	100	150
WER Best hypothesis:	72,1	69,6	68,6	68,1
WER Lattice:	42,3	38,8	37,3	37,3

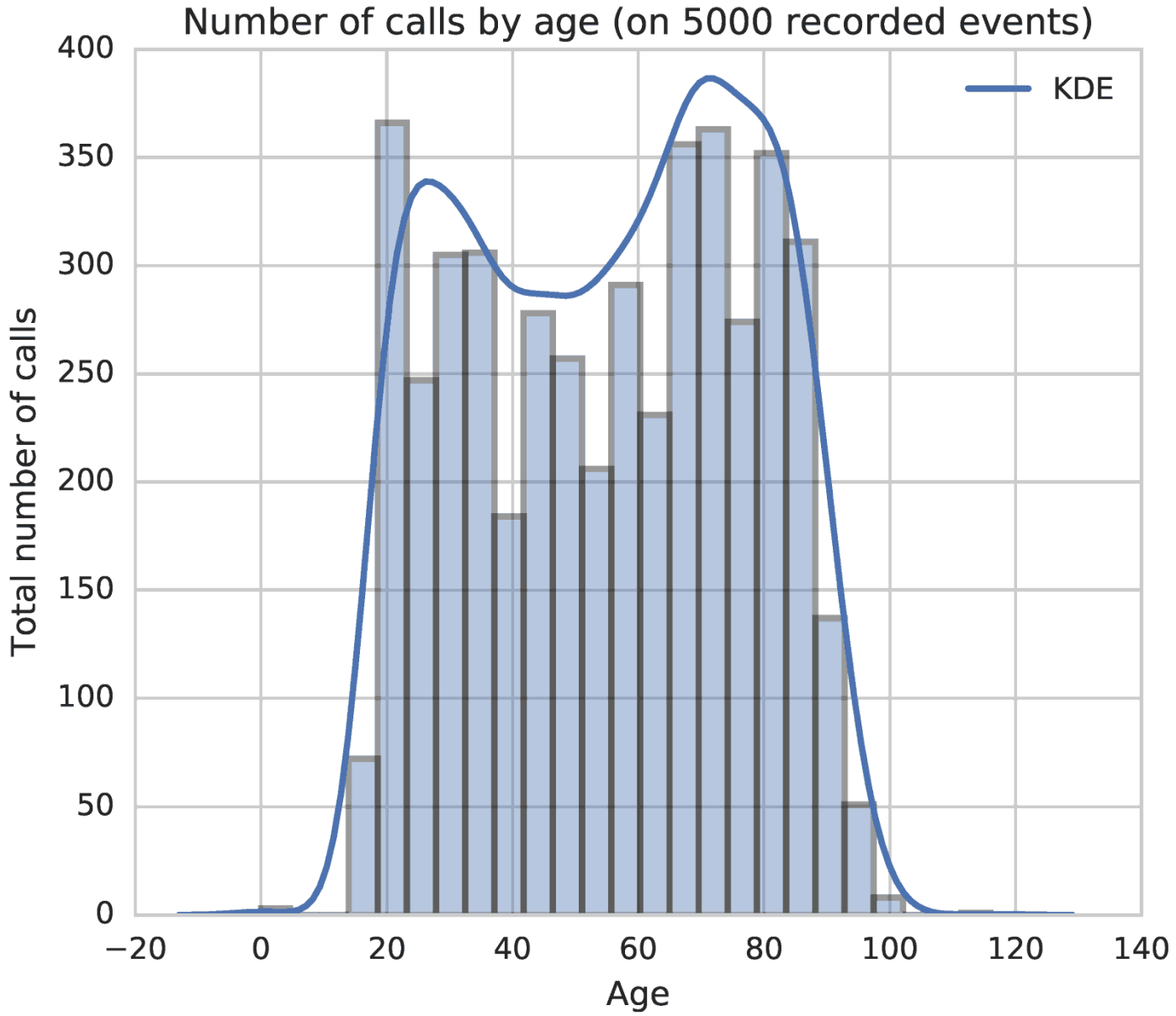
Emergency events

- Date and time
- Municipality.
- Identity of caller (neighbour, relative, bystander)
- Emergency type (disease, fire, etc.).
- Textual description of emergency
- Medical classification
- Urgency level: acute (red), urgent (yellow) and normal (green).
- Age and gender of the patient
- Patient health status (conscious or not, breathes or not)
- List of emergency responses that followed up the call


Classification frequency
Unclear problem
Intoxication - overdose
Chest pain - heart disease
Abdominal pain - back pain
Wounds - fractures - minor injuries
Reduced consciousness - paralysis
Psychiatry - suicide
Accidents
Breathing difficulties
Unconscious adult
Seizures
Assignment order
Traffic accident
Diabetes
headaches
Ear - nose - throat
Bleeding - not traumatic
Fever
Gynecology - pregnancy
Violence - abuse
Birth
Possible death - crip death
Urinary tract
Allergic reaction
Skin -rash
Foreign object in respiratory tract
Burn injuries - electrical injuries
0
400
800
1200
Total number of calls


Age distribution per emergency type and gender
Disease
Other accident
Intoxication
Psychiatry/psychosocial
Traffic accident
Hospitalization
Birth assistance
Other event - not urgent
Violence - victim of
Death, certain
Fire
To be deleted
Transfer to police
Ambulance for MD/clinic
Transfer to fire brigade
Gender
M
F
0
20
40
60
80
100
120
Age of patient


Number of calls by time of day
KDE
Total number of calls
400
350
300
250
200
150
100
50
0
0
3
6
9
12
15
18
21
24
Time of day


Number of calls by age (on 5000 recorded events)
KDE
Total number of calls
Age
400
350
300
250
200
150
100
50
0
−20
0
20
40
60
80
100
120
140

Examples

- Epileptic seizure
- Fire (with fire brigade, police and medical emergencies on line)
- Bleeding
- Intoxication
- Fall off a horse