A. Guidelines for the annotation of proactivity in task-oriented dialogues

We describe the procedure we follow for the annotation of utterance-level proactive behaviour in task-oriented dialogues using LibreOffice Calc.

Proactive behaviour in the context of task-oriented dialogues is displayed when one of the participants:

- does not act merely in response to the requests the other participant has made, so the behaviour is self-prompted and not simply reactive;
- has a long-term, goal-directed behaviour that predicts future states and needs, so the behaviour is somehow effective for the achievement of the dialogue goal;

A.1 Data Preparation

The requirements for a corpus to be annotated with the presented annotation schema are that written/transcribed dialogues be divided into *turns*, that turns be assigned to a CLIENT / AGENT and be divided into *utterances*.

Exporting data

From the dialogue dataset file (for instance a *.json* format file) export to a spreadsheet the following data:

- *turn number* to column A (when present in the dataset annotation),
- *speaker/writer* to column B,
- *utterance* to column C.

	A	B	C	D	E	F
1	1	**Client:**	I am looking for a place to to stay that has cheap price range			
2			it should be in a type of hotel,			
3	2	**Agent:**	Okay, do you have a specific area you want to stay in?,			
4	3	**Client:**	no, i just need to make sure it's cheap.			

Figure A.1: Example of a spreadsheet with prepared data.

Turn annotation - column A

We annotate with progressive cardinal numbers each *turn*, defined as the portion of dialogue spoken or written by a participant before the other intervenes.
Turn number can be annotated automatically in column A by exporting annotated datasets: when such annotation is either not present or imprecise, turn number can be annotated manually.

Client / Agent annotation - column B

Actors that take part in the dialogue are annotated in column B. We define them as:

- CLIENT = who asks for information or help in order to achieve one or some goals.
- AGENT = who helps the CLIENT reach their goal.

We adopt this nomenclature in column B during the annotation of every two-party dialogue. In multi-party dialogues – as from the Ubuntu Chat Corpus – we instead maintained the original nickname denomination present in the dataset, along with timestamp (message sending time), in order to better understand what was going on in the multi-party online chat. In this case we considered as CLIENT the user who poses the problem and asks for help, and as AGENT every single user who contributes to reaching the goal.
The Ubuntu Chat Corpus shows also the intervention of some moderator bots that prevent users of the support chat from clogging up the channel. These turns need not be analyzed further and shall be ignored, since they do not belong neither to the CLIENT nor to the AGENT. They can be recognized by looking at the username, which explicitly contains a 'bot' name.

Utterances - column C

Turns can be composed by single or multiple utterances: an utterance is defined as a small unit of speech/text within the turn corresponding to a single act that is bordered by the speaker's silence and/or prosodic boundary tones; as far as written chats are concerned, an utterance is bordered by the writer's sending of a single message (e.g. by pressing the enter key) and/or punctuation.
Different utterances take up one row each within the same column E.
Some datasets already have an annotation for differentiated utterances, others have not: we manually told utterances apart in this latter case.

A.2 Proactivity annotation

The annotation is made in two steps: in the first one the annotation of proactivity is performed; the second provides each utterance that has been labeled as proactive with a dialogue act communicative function.

Below one can see the tag-sets employed during the two annotation steps, which are thoroughly explained in the following sections:

1. Column D
    - PRO = proactive utterance;
    - $\emptyset$ = any other utterance (must not be tagged).
2. Column E
    - INFORM
    - OFFER
    - SUGGEST
    - REQUEST
    - INSTRUCT

A.2.1 Proactive utterance annotation - column D

In column D we annotate the presence of proactivity at the utterance level, signaling it in the same row in which the utterance in C presents some proactive content.

For a definition of what can be noted as proactive behaviour, see above in the introduction to these guidelines. Our annotation aims at marking as proactive an utterance in its totality: the utterance itself may as well contain some non proactive behaviour, but nonetheless it should be marked as proactive whenever it holds a piece of proactive content.

We annotate as follows:

- PRO = an utterance that contains proactive behaviour, offered either by the Agent or the Client.
- ∅ = any other utterance that does not contain proactive behaviour must not be tagged.

1	**Client:**	I need to take a train out of Cambridge,	
		I will be leaving town on Wednesday.,	
2	**Agent:**	There are 5 trains out of Cambridge on Wednesday.	
		Do you have a departure time in mind? ,	
3	**Client:**	I'd like to go to peterborough and leave after 12:45,	pro
		I have to attend a meeting beforehand.,	pro
4	**Agent:**	TR1879 leaves at 13:06 on Wednesday.	

Figure A.2: Example of proactive utterance annotation. Proactive utterances are highlighted in green; white utterances are not proactive.

Examples: non proactive cases.

- *Information seeking questions*: information seeking is not generally considered as proactive behaviour, but instead as the regular and natural way a goal-directed dialogue unfolds.

	[15:25] <K99Brain	trus, la partizione da 12G cosa è?	
	[15:25] <K99Brain	trus, è eliminabile?	
23	[15:25] <trus	eh a questo punto non lo so più…	fail

Figure A.3: Figure 3: Example of non proactive information-seeking questions. Non proactive utterances are in white. Failure utterances (cfr. 'Failure utterance annotation' below) are highlighted in red.

- *Goal setting*: sentences of any kind (e.g. assertive, interrogative, imperative, optative, exclamatory) in which the Client is expressing their needs and is therefore setting the goal of the dialogue – which typically happens within the first turns of the dialogue – are not considered proactive as well. That is because goal setting is necessary to establish the dialogue itself.

2	**Client:**	io vorrei alcune informazioni {m} per una vacanza che voglio fare quest' estate {breath}
		in particolare vorrei andare in un parco del trentino {em}
		non ho ancora scelto quale
		ma mi hanno parlato molto del parco del brenta {breath}

Figure A.4: Example of non proactive goal-setting Client's requests.

- *Answers to general information-seeking questions*: any response to an information-seeking question is not to be considered proactive, as long as it provides an answer to what is strictly requested, and nothing more.

1	**Client:**	I am looking for information about the City Centre North B and B hotel.
		Can you help me with that?,
2	**Agent:**	Yes! City Centre North B and B is an inexpensively-priced guesthouse in the north of town at 328A Histon Road.
		Would you like to book a room?,

Figure A.5: Example of non proactive answer to requested information.

Examples: proactive cases

- *Excess of information*: in answering to an information-seeking question (non proactive, as seen above), explicitly giving more information than what is strictly requested is considered as proactive behaviour.

- *Suggestions*: also suggestions offered in order to not simply reach the goal of the dialogue, but to achieve it in a more efficient and satisfactory way, are considered proactive.

- *Offer and request of action*: proactive behaviour is found also when a participant offers themselves or requests the other to do something useful to the goal achievement, yet not strictly necessary.

2	[17:46] <CoOltux	vitop	
	[17:46] <CoOltux	hai installato il player?	
3	[17:47] <vitop	CoOltux ho installato adobe flash player	
		ma l'aera dove dovrebbe visualizzare drimane vuota..	pro
		se disattivo il plugin mi dice che serve iadobe plugin..	pro

Figure A.6: Example of proactive excess of information utterances.

19	[15:22] <trus	mm scusa un attimo allora, fammi capire bene...	
		in poche parole è come se ubuntu non fosse altro che un programma di windows?	
20	[15:22] <K99Brain	trus, e tanto che ci sei, ti consiglio a quel punto di disinstallare da windows l'ubuntu che hai	pro
		e di fare una vera installazione su partizione dedicata	pro

Figure A.7: Example of proactive suggestion utterances.

33	[11:35] <DAMN3dg1rl	Gio12x5, che comando hai dato ?	
	[11:36] <DAMN3dg1rl	Gio12x5, chiudi qua,	
		e avvia con il terminale	
	[11:36] <DAMN3dg1rl	intanto tieni d'occhio l'output sul term,	pro
		e se da ancora problemi pastalo qua	pro
	[11:36] <DAMN3dg1rl	è un ottimo debug	pro

Figure A.8: Example of proactive request of action utterances.

5	**Agent:**	sì {silence}	
		aveva già in mente {e} una zona in particolare	
		io potrei mostrarle {breath} una cartina della val di fiemme {silence}	pro
		così {e} {silence} vede quali sono le località {silence} più importanti	pro

Figure A.9: Example of a proactive offer of action utterance.

A.2.2 Classifying proactivity: dialogue act communicative function annotation - column E

A classification of proactivity is made in column E, where the annotator is required to note what kind of dialogue act is performed by the participant in a proactive utterance.

We adopt these tags, which explain the communicative function of the utterance marked:

- INFORM = a proactive utterance where the participant provides information;
- OFFER = a proactive utterance where the participant proposes to do something or to provide some further information;
- SUGGEST = a proactive utterance where the participant suggests that the addressee should do something;
- REQUEST = a proactive utterance where the participant demands that the addressee do something or that the addressee provide some information;

- INSTRUCT = a proactive utterance where the participant provides the addressee with instructions to follow.

30	[10:21] <attempt	perche' usi xubuntu?		
31	[10:22] <paperino	perchè ho computer vecchio,		
		320 mb di ram, 20 gb hdd	c:pro	inform
	[10:22] <paperino	con xubuntu mi trovo malissimo	c:pro	inform
	[10:23] <paperino	già così va lento figuriamoci se metto ubuntu	c:pro	inform

Figure A.10: Example of *inform* utterance.

43	**Agent:**	e il prezzo indicativamente {silence} è sulle 100000 lire	a:pro	inform
44	**Client:**	per una doppia		
45	**Agent:**	doppia {em} con pensione completa	a:pro	inform
46	**Client:**	sì {em}		

Figure A.11: Example of *inform* utterance.

13	**Agent:**	Hai mai lavorato nel settore della contabilità?		
14	**Client:**	No, ma uso Excel molto bene.	c:pro	inform
15	**Agent:**	Perfetto!		

Figure A.12: Example of *inform* utterance.

		insomma se ci sono iniziative particolari		
		lo troverà segnalato {breath}		
		oppure le posso lasciare anche il numero dell' APT locale di rovereto	a:pro	offer
23	**Client:**	{e} sì		
		grazie		

Figure A.13: Example of *offer* utterance.

4	**Client:**	volevo		
		chiamavo per {m} {silence} avere un po' di informazioni {silence} su una una vacanza in inverno in val di fiemme		
5	**Agent:**	sì {silence}		
		aveva già in mente {e} una zona in particolare		
		io potrei mostrarle {breath} una cartina della val di fiemme {silence}	pro	offer
		così {e} {silence} vede quali sono le località {silence} più importanti	pro	offer

Figure A.14: Example of *offer* utterance.

45	[18:21] <vitop	provo		
	[18:21] <vitop	da kpakager ho soltanto adobe flash plugin		
46	[18:22] <xtree	vai nel sito di adobe flash		
	[18:22] <xtree	e vedi se te lo installa da firefox		
	[18:24] <xtree	oppure ti posso dire come installarlo in un altro modo	pro	offer

Figure A.15: Example of *offer* utterance.

	[15:24] <trus	ripartizionando il disco da windows,		
		anche se, come ho scoperto ora, ubuntu non è una vera e propria partizione,		
		ho dei problemi con l'installazione del terzo os?		
	[15:24] <trus	se re		
22	[15:24] <K99Brain	trus, ti consiglio di iniziare con il fare n bel backup dei tuoi dati, si quelli che hai in ubuntu che quelli di windows	pro	suggest

Figure A.16: Example of *suggest* utterance.

6	**Client:**	{breath} ecco volevo appunto chiederle {e} quali erano le località più vicine al parco del brenta		
7	**Agent:**	ma {em} può stare dalla parte del dell' adamello quindi pinzolo madonna di campiglio oppure nella zona del del brenta andalo molveno fai		
		[da dove] lei può {e} accedere al parco attraverso escursioni [che varie APT organizzano anche {e} di giorno in giorno]	pro	suggest
		escursioni con guide turistiche	pro	suggest
		quindi potrebbe anche approfittare di queste	pro	suggest

Figure A.17: Example of *suggest* utterance.

18	**Client:**	Va bene, non fa niente slightly_smiling_face		
		Sì, sono interessata		
19	**Agent:**	Molto bene! L'azienda si chiama PUBBLIDEA SRL,		
		è una piccola impresa ma sono sicura che potresti trovarti bene!	pro	inform
		Puoi contattarli direttamente al seguente indirizzo e-mail: info@azienda.com	pro	suggest

Figure A.18: Example of *suggest* utterance.

33	[11:35] <DAMN3dg1rl	Gio12x5, che comando hai dato ?		
	[11:36] <DAMN3dg1rl	Gio12x5, chiudi qua,		
		e avvia con il terminale		
	[11:36] <DAMN3dg1rl	intanto tieni d'occhio l'output sul term,	pro	request

Figure A.19: Example of *request* utterance.

12	**Agent:**	What is your destination?		
		And do you have any preference for day, departure or arrival time?,		
13	**Client:**	I want to go from cambridge to ely, no preference for time but I need to book for 8 people.,	pro	request

Figure A.20: Example of *request* utterance.

4	**Agent:**	Thanks for that information.		
		What area are you looking to stay in? ,		
5	**Client:**	The area doesn't matter		
		I would like an expensive hotel if you can find one. ,	pro	request

Figure A.21: Example of *request* utterance.

28	[10:19] <attempt	paperino imposta la velocita' di masterizzazione minima permessa per le iso.	pro	instruct
		altrimenti rischi che si rovinino.	pro	inform
	[10:20] <attempt	4 X	pro	instruct

Figure A.22: Example of *instruct* utterance.

6	[10:13] <paperino	come si fa?		
7	[10:13] <Marcofe	sai aprire una shell?		
	[10:13] <Marcofe	o meglio Accessorri→terminale	pro	instruct
8	[10:13] <paperino	il programma si avvia		

Figure A.23: Example of *instruct* utterance.

29	**Agent:**	sì		
		ho capito		
		per prenotare		
		deve chiamare direttamente l' albergo	pro	instruct

Figure A.24: Example of *instruct* utterance.

A.3 Side annotations

A.3.1 Failure utterance annotation - column D

In addition to the proactivity annotation, in the same column D we annotate also the presence of situations of failure in utterances which see a participant fail in answering to a question or in fulfilling a request. That is because failure situations often require some sort of repair: a proactive behaviour can be usefully employed in these cases. Thus, the annotation of failure situation can give us some insights on the correlation between these two phenomena.

We annotate it as follows:

- FAIL = an utterance of failure where the participant cannot answer a question or fulfill a request.

1	**Client:**	Hi. I'm looking for a hotel in the east.		
		The internet is not needed.,		
2	**Agent:**	There are no hotels that do not have internet,	fail	
		but 7 which do have it.	pro	inform
		Do you have a specific price range you'd prefer?,		

Figure A.25: Example of a failure utterance, highlighted in red.

46	**Client:**	sì {em}		
		con solo pernottamento e prima colazione		
47	**Agent:**	solo pernottamento non è possibile	fail	
		non è possibile in questo hotel {silence}		
		no		

Figure A.26: Another example of failure utterance.

Note that an utterance can therefore be marked alternatively with the pro, Ø, or fail tag in column D.

A.3.2 Further annotations - column F

Here the annotator can insert any other piece of information he believes to be useful to the analysis of the results, or any doubt, personal opinion or comment which may have risen during the annotation tasks.